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Dentistry & Otolaryngology

Posterior Mandibular Ridge

Bilateral Abductor Vocal Cord

Highlights

Denture Impression Procedures

Root Resorption with Bioceramic

Discovering Thoughts, Inventing Future

VOLUME 19 ISSUE 1 VERSION 1.0

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Complete Denture Impression Procedures and Techniques Practised by Dental Surgeons of a Dental College in Eastern Part of India: A Short Survey

By Dr. Paul R., Dr. Dey N., Dr. Konar M., Dr. Bhattacharyya J., Dr. Das S. & Dr. Ghosh S.

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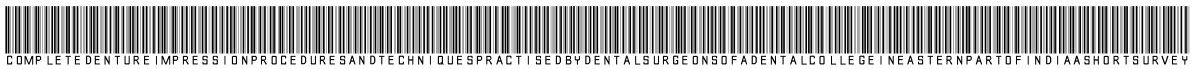

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Keywords: survey, CD impression, disinfection, border molding, custom tray, sterilization.

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I. Introduction

Despite the increasing popularity of dental implants, complete denture (CD) prosthesis remains the most popular treatment modality for edentulous patients in socioeconomically weaker countries like India. Proper impression making is of utmost importance in the success of complete denture prosthesis. Several techniques for impression making following different school of thoughts including 'mucostatic,' 'muco-compressive,'' selective pressure,' 'functional technique' have been recommended in different standard textbooks of Prosthodontics by various authors.[1-5] Numerous studies have been conducted to find out the most suitable impression making procedure along with different modifications and refinements of protocols to enhance the final outcome. A large variety of impression materials from age-old Plaster of Paris to recently developed polyvinyl siloxane (PVS) and polyether (PE) have been advocated in search of ideal impression making of edentulous mouth. The choice of impression materials, impression tray, use of a spacer and its designing vary from clinician to clinician and so do their opinions regarding the final result.

A large number of surveys based on US and European countries regarding impression making for CD fabrication have been reported in various Dental journals by numerous researchers like Levin B and Sanders J L, Jaggers J H et al., Hyde T P et al., A l-Ahmar A O et al., Mehra M et al. etc. [1, 6-9] Probably due to lack of centralized documentation system very few surveys have been conducted across India on this issue and no comprehensive survey could be found in literature till date regarding the eastern part of India. [10-13] Therefore, the present survey aims to find out the current trends and their deviations from established procedures practiced by a group of dental surgeons attached with Guru Nanak Institute of Dental Sciences and Research, Kolkata, West Bengal, India.

II. Methodology

A modified questionnaire based on previous surveys was distributed amongst 150 dental surgeons who are attached with Guru Nanak Institute of Dental Sciences and Research, Kolkata in West Bengal. [8, 9, 12-14] The questionnaire was tested and validated by the faculty members of the Department of Prosthodontics. The questionnaire was so designed that there was freedom of selecting multiple options to determine the current trend of clinical practice. The confidentiality of the respondents was maintained. The questionnaire contained 15 questions (Table 1) and where multiple answers were received, each one was counted. Percentage calculation was done out of total responses received for a particular question. The results were prepared by tabulating received data using Microsoft Excel software and analyzed. (Table 2)

Table 2: Results

Question No.	No. of Respondent	No Reply	Single Option	Only Option A [a]	Only Option B [b]	Only Option C [c]	Only Option D [d]	Multiple Options	Combination of multiple options
1	124	0	124	1 (0.8%)	123 (99.2%)			0	
2	124	0	102 (82.25%)	87 (70.2%)	15 (12.1%)	0	0	22 (17.74%)	a+b = 19, b+c=2 , a+b+c= 1
3	122	2	116 (95.1%)	111 (90.9%)	5 (4.1%)			6 (4.9%)	a+b= 6
4	123	1	123	33 (26.8%)	90 (73.2%)			0	
5	124	0	124	39 (31.45%)	85 (68.54%)	*Glutaraldehyde= 22, Disinfectant= 7, NaOCl= 4, Chlorohexidine= 3, Ethyl alcohol= 3* ***(Total= 39)***		0	
6	123	1	123	123	0			0	
7	123	1	121(98.37%)	117 (90.4%)	4 (3.25%)			2 (1.6%)	a+b=2
8	119	5	110 (92.43%)	109 (91.6%)	0	1 (0.84%)	0	9 (7.56%)	a+b= 4, a+c= 5
9	123	1	123	117(95.1%)	6 (4.8%)			0	
10	113	11	111 (98.23%)	75 (66.37%)	16 (14.15%)	17 (15%)	3 (2.65%)	2 (1.76%)	a+d=1, a+c=1
11	109	15	100 (91.74%)	52 (47.7%)	11 (10.1%)	15 (13.76%)	22 (20.2%)	9 (8.25%)	a+b= 2,a+c= 3, b+d= 2, a+d= 2
12	120	4	120	118 (98.34%)	2 (1.66%)			0	
13	119	5	112 (94.12%)	110 (92.43%)	2 (1.68%)	0	0	7 (5.88%)	a+b= 4, a+b+c= 2, a+c= 1
14	123	1	108(87.8%)	4 (3.25%)	91 (73.98%)	13 (10.57%)	0	15 (12.2%)	a+b=10, a+c= 2, b+c=1, a+b+d=2
15	123	1	123	36 (29.27%)	87 (70.73%)	*Glutaraldehyde= 21, Disinfectant= 7, NaOCl= 4, Chlorohexidine= 3, Ethyl alcohol= 1* ***(Total= 36)***		0	

III. Results

A total number of 124 practitioners took part in this survey (out of 150), yielding a response rate of 82.7% (Table 2). Out of them, 26 specialists [6 (4%) endodontists, 9 (6%) orthodontists, 1 (0.7%) oral pathologist and 10 (6.7%) oral maxillofacial surgeons] did not participate in this survey.

123 (99.2%) respondents, who fabricated CD, reported that they made both primary and final impressions. Only one respondent believed that a single impression was enough for CD fabrication.

102 (82.25%) practitioners selected either impression compound or irreversible hydrocolloid as material for making the primary impression. Of them, 87 (70.2%) practitioners used only impression compound as the material of choice for primary impression while 15 (12.1%) respondents used irreversible hydrocolloid. 22 (17.74%) respondents used both impression compound and irreversible hydrocolloid as primary impression material according to the nature of the residual alveolar ridge. (Fig.: 1)

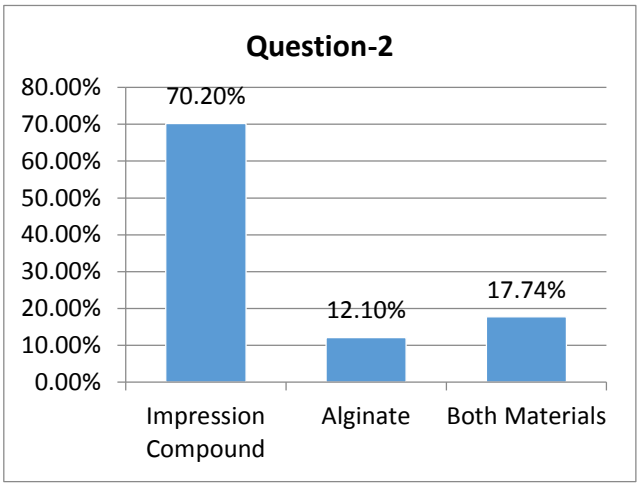

Figure 1: Percent distribution of responses regarding tray types preferred for making the primary impression.

For the primary impression, 111 (90.9%) respondents used only stock metal trays while 5 (4.1%) respondents preferred only plastic trays. Both metal and plastic stock trays were used by 6 (4.9%) respondents according to the condition of the alveolar ridge. (Fig.: 2)

Only 33 (26.8%) practitioners used modified stock trays whereas 90 (73.2%) respondents did not. Some of them, who use modified stock trays, were of varied opinion and commented as "if required," "not always," "depends on ridge condition" etc.

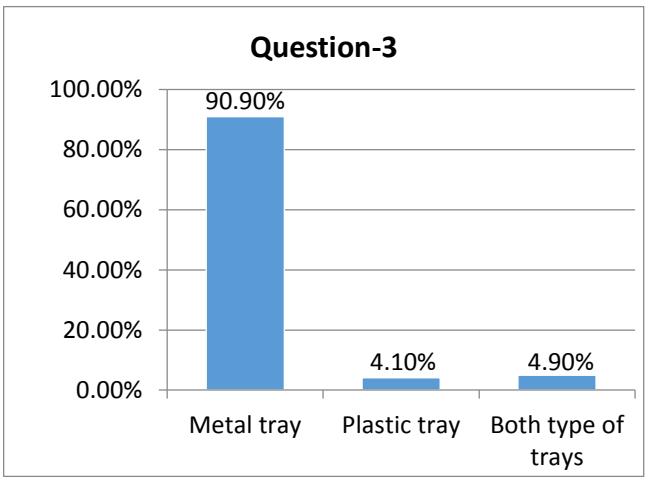

Figure 2: Percent distribution of responses regarding tray types preferred for making the primary impression.

For making a final impression, 117 (90.4%) respondents regularly used a custom tray, 4 (3.25%) respondents used modified primary impression as a special tray and only 2 (1.6%) clinicians followed both procedures. (Fig.: 3) Two practitioners added that they used "the previous denture as a custom tray" whenever it was feasible.

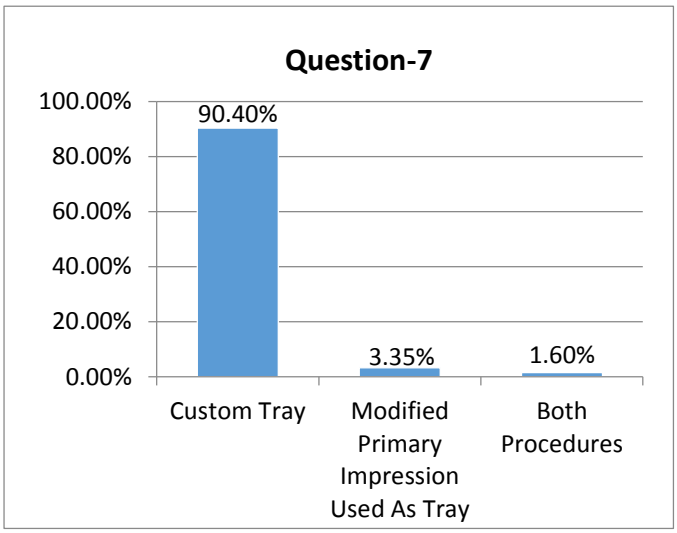

Figure 3: Percent distribution of responses regarding tray types preferred for making the final impression.

Larger part of the dental surgeons, i.e., 109 (91.6%) favoured self-cure acrylic resin for making a custom tray. Rest of the respondents 9 (7.5%) used multiple materials including self-cure acrylic resin, shellac base plate, and visible light cure (VLC) tray material. Only one respondent preferred the shellac base plate as tray material. (Fig.: 4)

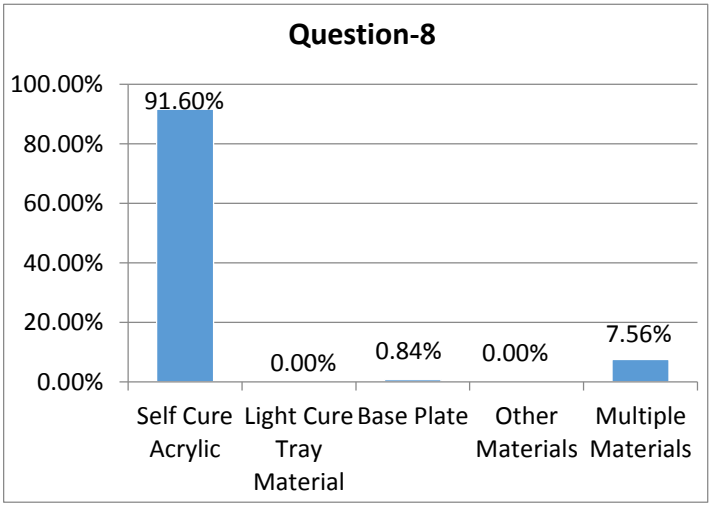

Figure 4: Percent distribution of responses for materials for making a custom tray.

117 (95.1%) practitioners used spacers on custom trays while only 6 (4.8%) respondents did not. Of them, 75 (66.37%) respondents used full spacers with tissue stops, followed by 16 (14.15%), who preferred full spacers except in major stress-bearing areas and PPS areas.17 (15%) employed spacers only on secondary stress bearing areas and relief areas. 3 (2.65%) respondents mentioned that they used spacers in special circumstances only. Out of 2 (1.76%) respondents who reported with multiple options; one respondent used both full spacer with tissue stops and spacers only in secondary stress areas and relief areas; while one respondent used a spacer in special circumstances along with the full spacer design with tissue stops. (Fig.: 5)

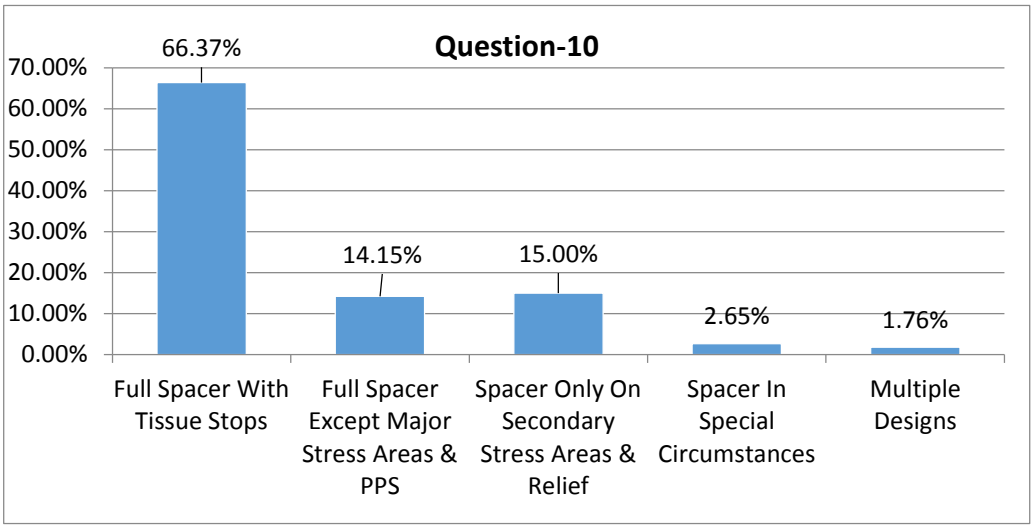

Figure 5: Percent distribution of responses for spacer design.

During final impression making of knife edge or flabby ridge, majority of respondents, i.e., 52 (47.7%) made relief holes in custom tray, 22 (20.2%) used a modified impression technique (composite impression techniques, window method, etc.), 15 (13.76%) applied spacer on the cast, and 11 (10.1%) performed a selective reduction of custom tray. 9 (8.25%) practitioners preferred combination of methods, like selective reduction of trays along with relief holes (2 respondents), extra spacers on the cast along with relief holes (3 respondents), both selective tray reduction and spacer on cast (2 respondents), and modified impression technique using tray with relief holes (2 respondents). (Fig.: 6)

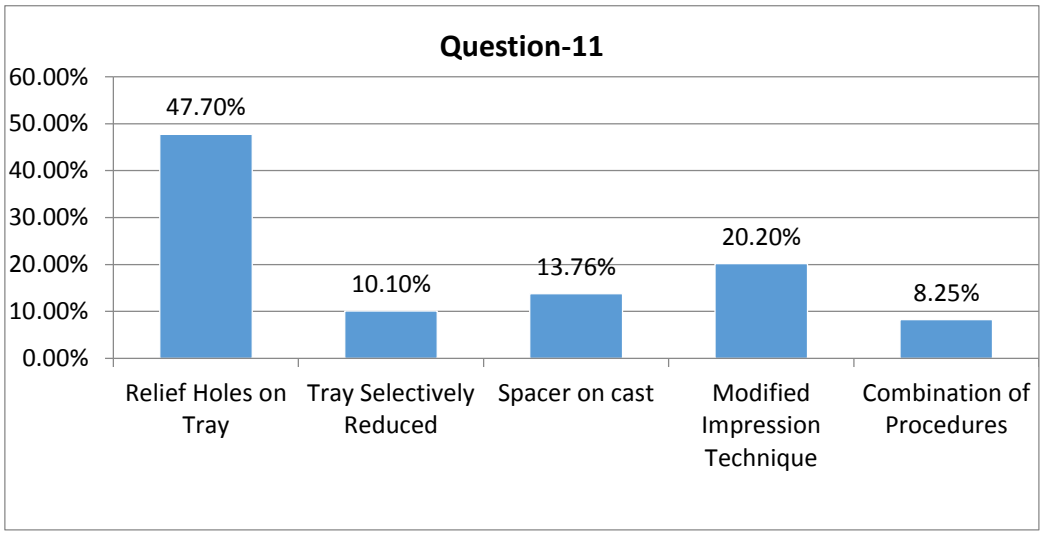

Figure 6: Percent distribution of responses for the type of relief used for knife edge alveolar ridge and flabby tissue.

118 (98.34%) respondents preferred border molding before making a final impression. Modeling plastic compound or green stick was the first choice as border molding material by 110 (92.43%) respondents followed by PVS by 2 (1.68%) respondents. 7 (5.88%) dental surgeons opted for multiple options, four of them preferred both green stick compound and PVS, while one respondent chose the green stick and PE. Only two respondents reported that they used all three border molding materials. (Fig.: 7)

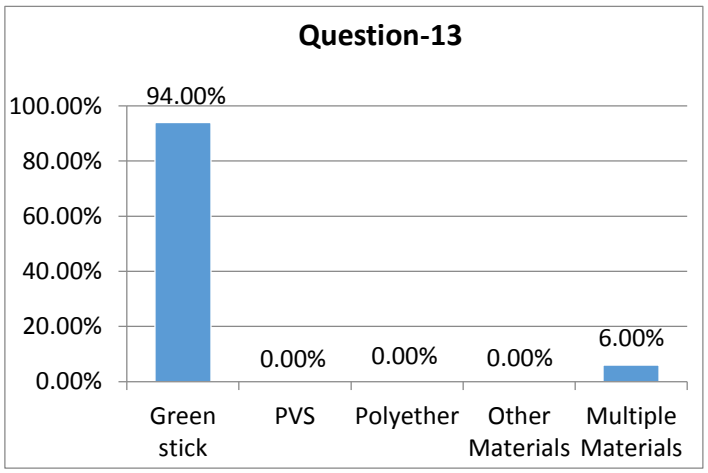

Figure 7: Percent distribution of responses for border molding material.

As the final impression material, Zinc Oxide Eugenol (ZnOE) was preferred by 91 (73.98%) respondents. Only 13 (10.57%) practitioners used irreversible hydrocolloid while 4 (3.25%) respondents used PVS. 15 (12.2%) respondents reported that they used multiple materials for final impression depending on ridge condition. (Fig.: 8) Among these 15 respondents, 9 of them selected both PVS and ZnOE, followed by PVS and alginate by two respondents. One respondent used alginate, and ZnOE while two of them were comfortable with PVS, ZnOE and PE. Some respondent made comments as, "PVS for maxillary and ZnOE for mandibular arch," "Light body for mandibular resorbed ridge," "medium body PVS" etc.

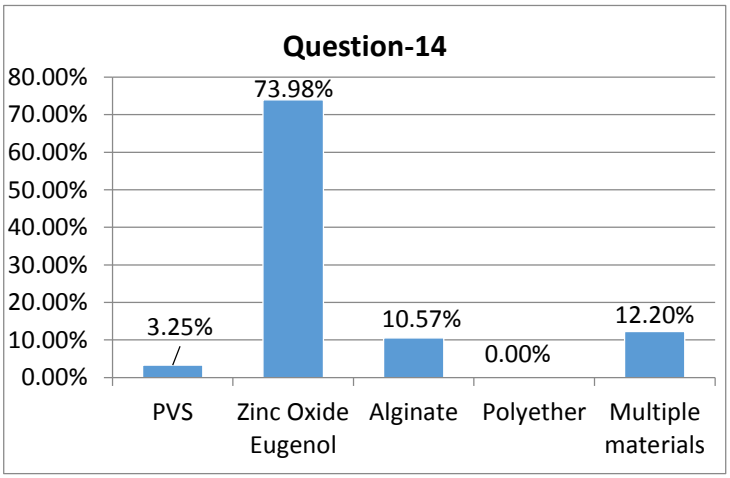

Figure 8: Percent distribution of responses for materials for making the final impression.

Regarding disinfection procedure of impression before sending to the laboratory, 39 (31.45%) practitioners disinfected primary impression whereas final impression disinfection was done by 36 (29.27%) only. Respondents who routinely did impression disinfection commonly used glutaraldehyde (56%-58%). Chlorohexidine and sodium hypochlorite were applied as a disinfectant by 11% and 8% practitioners respectively. Three respondents (7%) used ethyl alcohol to disinfect impressions. 19% of respondents could not mention the name of the disinfectant they used. (Fig.: 9, 10, 11 and 12)

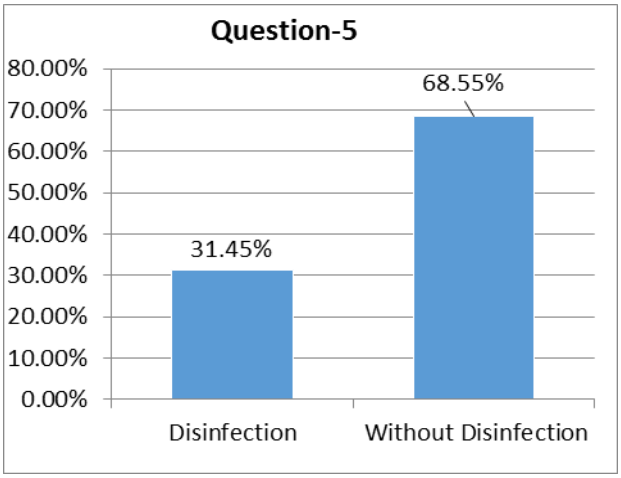

Figure 9: Percent distribution of responses for the disinfection procedure of the primary impression.

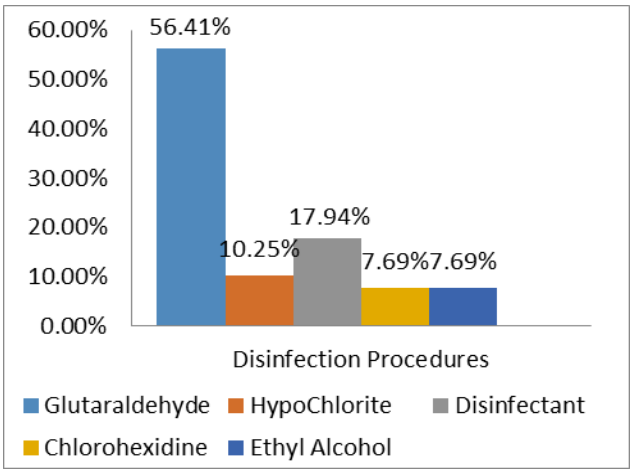

Figure 10: Percent distribution of responses for different disinfectants used to disinfect the primary impression.

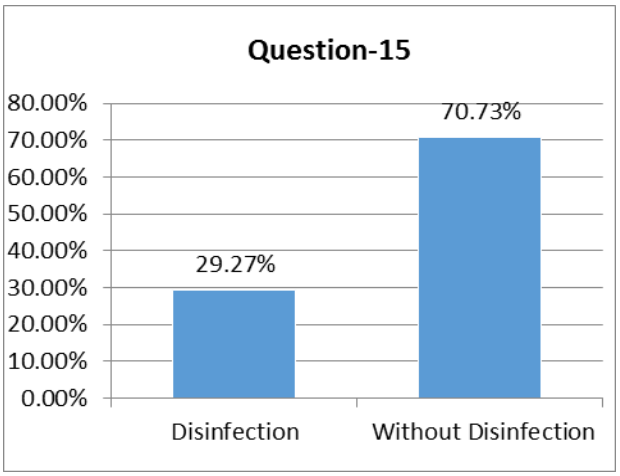

Figure 11: Percent distribution of responses for disinfection procedure of final impression.

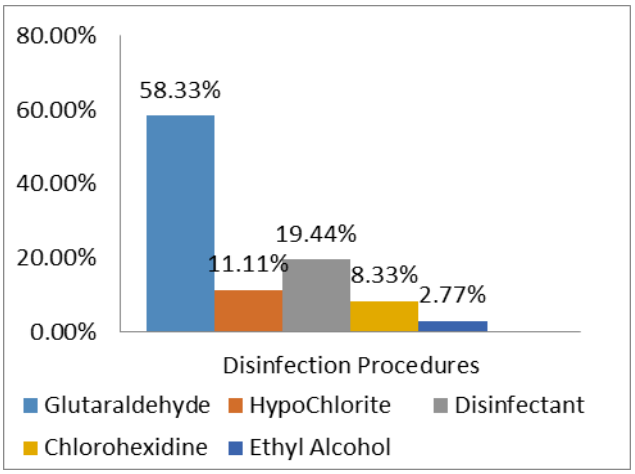

Figure 12: Percent distribution of responses for different disinfectants used to disinfect final impression.

IV. Discussion

The present survey did not direct the respondents to pick only one answer which made the interpretation of results more complex but enhanced the acceptability of the study to find out the directions of the current practice of CD fabrication.

This survey depicts that the majority of dental surgeons (99.2%) practicing CD fabrication preferred making both the primary and final impressions. This result is by the findings of previous surveys conducted in different parts of India, as well as surveys based on US and UK. [1, 6 - 13] Most standard textbooks of Prosthodontics recommend for both primary and final impression because primary impression is always overextended and fails to replicate minute surface details. On the contrary, a border molded secondary or final impression in custom tray replicates better border details, alleviates over-displacement of soft tissue and forms a proper peripheral seal.[3 - 5]

Impression compound is evident to be the material of choice for primary impression in this survey, though surveys across US and UK established irreversible hydrocolloid as the first preference for primary impression material for the last five decades. [8, 9, 15, 16] However, surveys across India show a mixed response. Two surveys in north India and Chennai established irreversible hydrocolloid as the best primary impression material (i.e., 100% and 71% respectively). [10, 13] The result of the present survey is supported by the result of surveys by Kakatkar VR et al. and Shah RJ et al. where they both found about 70% practitioners of western India prefer impression compound. [11, 12]

Majority of respondents (91%) of the present survey used metal stock trays which is contrary to the result of previous surveys. [12, 13, 16] A few practitioners (4%) reported using only plastic stock trays, but the problem may arise with poor fitting plastic trays as their wall flexure may produce inaccuracy.[17]

Guidelines from the British Society for the Study of Prosthetic Dentistry (BSSPD) recommended rigid trays for better accuracy. According to McCord and Grant, both metal and plastic rigid trays of appropriate

extension can be used for making accurate primary impressions. [2, 17]

Regardless of the type of impression trays, oversized trays create tissue distortion, whereas undersize trays are unable to carry the impression material up to the proper extent of sulcus depth. So, a properly formed tray is mandatory to make a flawless impression. [9] Present survey reveals that only 27% practitioners regularly modify the impression trays which is in agreement with the finding of a recent survey of a post-doctoral program of dental schools in the US as well as in Gujrat.[12,18] Thermoplastic tray can be a better option because it is easily moldable, and subtractively adjusted to permit extension modifications as needed. [18, 19]

Most of the (90%) practitioners participating in this survey used a custom tray for final impression, and their material of choice (91.6%) was auto polymerizing acrylic resin. The surveys in other cities of India also yielded similar results. [11 - 13]One previous survey based on dental schools of US conducted in 1985 by Jaggers JH et al. showed that 98% preferred auto polymerizing acrylic resin for custom tray fabrication. A strikingly different scenario was found in a recent survey in 2014 by Mehra M et al. where VLC acrylic resin tray material was the material of choice for fabricating custom tray. [7, 9] Advantages of using VLC acrylic resin tray material are complete polymerization without residual monomer, better accuracy of fit, superior physical and handling properties than auto polymerizing acrylic resin. [14]

The present study elicited varied responses about spacer design which is very similar to a previous Indian survey. [12]Majority of respondents (66.37%) favored full spacers and tissue stops which is recommended by J.J. Sharry as well as by Morrow, Rudd, and Rhoads. 15% of respondents used Bernard Levin's design (i.e., spacer only in secondary stress areas) whereas 14% preferred full spacer except major stress-bearing areas and PPS areas, i.e., Boucher's design. [12, 18, 20] Ultimately all spacer designs of present survey attempt to follow Boucher's selective pressure technique of impression making. 9% of respondents did not reply, which exhibits that they had no personal preference and depended on laboratory technicians.

Present survey showed the majority of practitioners (47.7%) used relief holes on the tray and 20.2% practitioners used modified impression technique to encounter special clinical condition like a flabby ridge, knife-edge ridge or unemployed ridges which is harmonious with the result of previous studies. On the other hand, a US-based study revealed that modified impression technique with placing a window in the custom tray (46%) is more popular than placing relief holes (26%). [9, 12] These differences of opinion may be due to the reason that the modified impression technique is more time consuming, technique sensitive and needs proper clinical training and expertise. The aim of all the procedures is to record the hyperplastic tissue in undistorted position while to obtain support from the healthy tissue. [3] Another noticeable fact that a large number (12%) of respondents skipped this question which implies a lack of confidence in managing these clinical conditions.

Majority of the participants (98.34%) of this survey followed the conventional method of border molding before making the final impression. Similar findings have been reported in surveys of other parts of India as well as in US and UK. [7, 9, 11- 13] Regarding border molding material most of the respondent (92.43%) preferred green stick compound due to its ability of sectional molding & corrections, low cost, long shelf life, and dimensional stability. This result is harmonious with the findings of the surveys conducted in India. [11-13] But scrutinizing previous surveys of the US and UK, it is evident that a changeover in the choice of border molding material took place from the 1980s to 2010s. [1, 7, 9, 16, 21] A survey in 1984 showed green stick was the first choice for 96%, but other surveys in 2005, 2008 and 2014 reveal that it descends to 67%, 69%, and 71% respectively. [1, 7, 9, 21] The use of elastomeric material for border molding significantly gained popularity day by day due to its advantages like; simultaneous molding of the full arch in single insertion, less time consuming and comfortable for patients. [9, 22, 23] A recent survey in cities of western India showed a greater percentage (17%) of practitioners using elastomeric materials compared to the present survey. [11]

The greater number of respondents (73.98%) taken part in this survey preferred ZnOE for making a final impression which is in agreement with the results of other surveys in India. [11-13]A remarkably different result appears when previous surveys of US and UK are compared. In the70s and 80s, ZnOE was the material of choice for final impression, but elastomeric impression materials mainly polysulfide rubber gradually gained popularity in late 80s and 90s. In the last two decades, PVS materials eliminated the older traditional materials and became the most popular final impression material among the practitioners of the US. [6, 7, 9, 16, 21, 24] The reasons behind this are ease of handling, elastic recovery from undercuts, good tear strength, adequate working and setting times, dimensional stability and availability of different consistency and newer generation "hydrophilic" PVS. [9, 17] Despite that, low cost, accurate surface details, low viscosity and dimensional stability of ZnOE still make it well accepted to Indian dental practitioners.

Majority of the practitioners (70%) do not routinely disinfect impressions before sending to the laboratory. Some of them only rinse the impressions under running tap water which is not sufficient to prevent

cross contaminations. As a result, transmission of infectious diseases like Hepatitis-B, Hepatitis-C, HIV may become a real threat to all health care personnel. It is not an exception because several UK based surveys reveal similar results. [1, 8] Present survey also exhibits a lack of intelligibility concerning the selection of disinfectants and method of application. The reason behind this fact is 19% respondents using disinfectant failed to mention the compositions, method or even trade names. Practitioners mostly preferred 2% glutaraldehyde (58%) for both primary and final impressions which are only recommended for addition silicone, ZnOE. Impression compound, polyether, and alginate impression should be disinfected with (0.5%) hypochlorite solution or iodophor, but only 8% practitioner used hypochlorite. Some of them mentioned ethyl alcohol and chlorohexidine as disinfectants which are not recommended in standard guidelines. [25, 26, 27] Incomplete responses on disinfection procedure indicate that infection control should be mandatory and practitioners should be more aware and specific regarding the selection of compatible disinfectant according to impression material used, the method of application and period for complete disinfection.

Out of 124 respondents only 25 (20.1%) Prosthodontists included themselves in this survey. If the survey was conducted exclusively among Prosthodontists, probably it may elicit a different outcome.

V. Conclusion

It can be summarised that present survey has succeeded to unveil the current trends of impression making in daily private practice by a certain group of dental surgeons who are attached with Guru Nanak Institute of Dental Sciences and Research which reflects the trends followed by the practitioners of Kolkata, West Bengal, i.e., the eastern part of India. Present survey reveals that the majority of practitioners mostly followed the basic methods and protocols documented in standard Prosthodontics textbooks. Most varied responses are elicited regarding spacer designs and type of relief for special clinical conditions of the residual alveolar ridge.

Limitations of this survey include a short sample size and inability to judge the truthfulness of the self-reported answers of the respondents. These findings are impossible to correlate with the success of denture as any individual would generally not admit to failures in the process that he/she has chosen. A further survey with a larger sample size may be needed as it may change the results.

Within the limitations of the survey, it can be concluded that:

1. Majority of practitioners prefer making the primary impression in the stock metal tray using impression compound.
2. Full spacer with tissue stops is the spacer design preferred by the majority of respondents.
3. Most of the respondents made a final impression using custom trays fabricated of the auto polymerizing acrylic resin after border molding with modeling plastic compound.
4. Material of choice for final impression is ZnOE impression material.
5. A majority of dentists made relief holes in the custom tray as a special consideration for flabby or knife edge alveolar ridge.
6. Impression disinfection procedure is neglected by the majority of the clinicians.

Abbreviations

	Abbreviations	Full form
1	CD	Complete denture.
2	ZnOE	Zinc Oxide Eugenol.
3	PVS	Poly vinyl siloxane.
4	PE	Polyether.
5	VLC	Visible Light Cure

Declaration of respondents' consent

In the questionnaire the dental surgeon(s) taken part in this survey has/have given his/her/their consent for sharing his/her/their clinical information for publication in the journal. The dental surgeons understand that their names and initials will not be published and due efforts will be made to conceal their identity.

Conflict of interest

No conflicts of interest

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Table 1: Questionnaire of the survey

DEPARTMENT OF PROSTHODONTICS AND CROWN & BRIDGE
GURU NANAK INSTITUTE OF DENTAL SCIENCES AND RESEARCH,
PANIHATI, WEST BENGAL, KOLKATA-700114.

COMPLETE DENTURE IMPRESSION PROCEDURES AND TECHNIQUES PRACTICED BY DENTAL SURGEONS IN G.N.I.D.S.R.: A SURVEY

Name: Dr. …… **Serial No.:**……
Department: Prostho. / Perio. / Endo. / Pedo. / Ortho. / O.S. / O.P. **Date:** ……..
Designation: Faculty / Clinical tutor / PGT / Other…….
Contact Number: ……

Instruction and Declaration: *Please tick all responses regarding CD fabrication that you apply in your dental practice. More than one answer may be selected. Apart from the below mentioned options, additional remarks to be mentioned where felt necessary. All data collected will be kept strictly confidential and will not be identified by other practicing dentist in future publication and presentation. Thank you for your co-operation.*

1. What impression procedures are followed?
   - o Only primary impression.
   - o Both primary and final impression.

   Remarks: ……..
2. What material is used for making primary impression?
   - o Impression compound.
   - o Alginate.
   - o Silicone.
   - o Other material (please specify).

   Remarks: ……..
3. What type of stock tray is preferred?
   - o Metal tray.
   - o Plastic tray.

   Remarks: ……..
4. Are stock trays modified before taking primary impression?
   - o Yes.
   - o No.

   Remarks: ……..
5. Is disinfection of primary impression done before sending to laboratory?
   - o Yes.
   - o No.

   If "Yes", Type of disinfection procedure ……
6. Is custom tray used for making final impression?
   - o Yes
   - o No

   Remarks: ……..
7. Tray used for making final impression:-
   - o Special / Custom Tray
   - o Primary impression modified and used for making final impression.

   Remarks: ……..
8. What type of material is used in fabrication of special tray?
   - o Cold cure acrylic resin.
   - o Visible light cure tray material.
   - o Base plate.
   - o Other material (please specify).

   Remarks: ……..

9. Whether spacer is used in custom tray?
   - o Yes.
   - o No.

   Remarks: ……..

10. Design of spacer used:-
    - o Full spacer with tissue stops.
    - o Full spacer except major stress bearing areas and PPS areas.
    - o Spacer covering only on secondary stress bearing areas and relief areas.
    - o Spacer in special circumstances only.

    Remarks: ……..

11. Type of relief mostly used for flabby or knife edge ridge:-
    - o Relief holes on tray.
    - o Tray selectively reduced.
    - o Spacer on cast.
    - o Modified impression technique.

    Remarks: ……..

12. Border moulding of custom tray is performed or not?
    - o Yes.
    - o No.

    Remarks: ……..

13. Which material is used for border moulding?
    - o Modeling plastic impression compound (Green stick).
    - o Poly vinyl siloxane.
    - o Polyether.
    - o Other material (please specify).

    Remarks: ……..

14. Which material is used for taking final impression?
    - o Poly vinyl siloxane.
    - o Zinc oxide eugenol/eugenol free impression paste
    - o Alginate
    - o Polyether
    - o Other material (please specify)

    Remarks: ……..

15. Is disinfection of final impression done before sending to laboratory?
    - o Yes.
    - o No.

    If “Yes”, Type of disinfection procedure ……

……

Signature

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Evidence based Research in Dentistry: An Insight

By Tushar Pruthi, Prachi Goyal, Shivani Mathur & Vinod Sachdev

I.T.S Dental College

Abstract- Dentists need to make clinical decisions based on limited scientific evidence. The goal of evidence-based dentistry is to help practitioners provide their patients with optimal care. This is achieved by integrating sound research evidence with personal clinical expertise and patient values to determine the best course of treatment. The basis of evidence-based dentistry and its application in research work.

Keywords: *evidence-based research, research work, clinical decision.*

GJMR-J Classification: *NLMC Code: WU 300*

Strictly as per the compliance and regulations of:

Evidence based Research in Dentistry: An Insight

Tushar Pruthi [α], Prachi Goyal [σ], Shivani Mathur [ρ] & Vinod Sachdev [ω]

Abstract- Dentists need to make clinical decisions based on limited scientific evidence. The goal of evidence-based dentistry is to help practitioners provide their patients with optimal care. This is achieved by integrating sound research evidence with personal clinical expertise and patient values to determine the best course of treatment. The basis of evidence-based dentistry and its application in research work.

Keywords: evidence-based research, research work, clinical decision.

I. Evidence Based Research in Oral Health

Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research" (Sackett, 1996)[1].

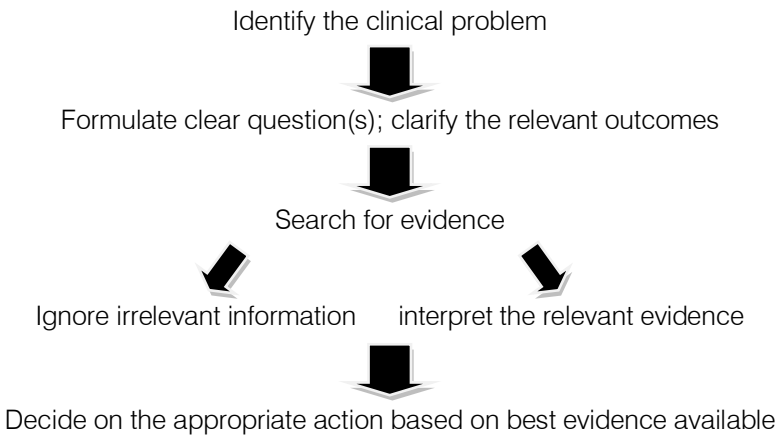

Figure 1: Main steps in practicing evidence based dentistry

Evidence-based health care (EMHC) has a wider definition as decisions that affect the care of patients are not only taken by clinicians, but managers and health policy makers may also be involved. The medical or dental journals publish an overwhelming number of randomized controlled trials (RCT) annually that usually form the evidence base for determining the relative effectiveness of different therapies including drugs, procedures, and treatments for the management of different diseases or conditions. Depending on the volume of literature for a particular topic, it is often not sensible for the health care professionals to undertake this searching and appraising of the evidence and researchers have developed a methodology for summarizing the evidence in the form of systematic reviews.

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There has been some confusion about the terms "systematic review" and "meta analysis." Some researchers have used the two terms synonymously but perhaps the more widely accepted definition is that a systematic review is the whole process of locating the studies to be included, appraising their quality, and summarizing the results, including a summary of the data from different studies if appropriate. The specific statistical pooling of the data is known as meta-analysis. Meta analysis is the application of statistical procedures to examine tests of common hypothesis from more than one study.

Systematic reviews differ from traditional reviews of the literature in several ways. They are based on a focused question and are undertaken in a systematic manner according to predetermined criteria, specifying which databases are searched, what the inclusion criteria are, and how the study quality will be assessed and the data will be synthesized.

Traditional reviews of literature were frequently undertaken in a haphazard manner and tended to be prone to bias often reflecting the views of the authors. Systematic reviews are important as they reduce large

amounts of information into manageable portions. They are used to formulate guidelines and policy and are therefore an efficient use of resources.

Systematic reviews may increase the power or precision of the effect estimate of the relative effectiveness between the interventions being assessed and if well conducted should be used to limit bias and improve accuracy.

Systematic reviews, such as primary research studies, may be well or poorly conducted and there are guidelines for assessing the quality of systematic reviews.

PRISMA provides a checklist and flowchart for the reporting of systematic reviews that include randomized controlled trials (http://www.equator-network.org).

MOOSE is a similar checklist and flowchart, also available through this website, for assessing reviews of observational studies.

II. The Cochrane Collaboration

The Cochrane Collaboration was established in Oxford in 1993 led by Sir Iain Chalmers. The ideas behind the initial aims of the Cochrane Collaboration collecting together and summarizing data from randomized controlled trials were put forward by Archie Cochrane in his book "Effectiveness and Efficiency" (Cochrane, 1972) that was the original textbook on evidence-based medicine. In 1979, Archie Cochrane had issued a call to assemble "a critical summary, adapted periodically, of allrelevant randomized controlled trials" (Cochrane, 1979).

The Cochrane Collaboration website (http://www.cochrane.org/index.htm)[5] is very helpful and summarizes its function as follows:

The Cochrane Collaboration is an international not-for-profit and independent organization, dedicated to making up-to-date, accurate information about the effects of healthcare readily available worldwide. It produces and disseminates systematic reviews of healthcare interventions and promotes the search for evidence in the form of clinical trials and other studies of interventions(Padiyar et al, 2011)[6.]

The major product of the collaboration is the Cochrane Database of Systematic Reviews (CDSR) that is published quarterly as part of The Cochrane Library, a regularly updated collection of evidence-based health care databases available on CD-ROM and on the internet. Additional databases in The Cochrane Library include the following:

The Database of Abstracts of Reviews of Effects (structured abstracts of 11,000 non-Cochrane systematic reviews from around the world. The reviews have been appraised by reviewers at the Centre for Reviews and Dissemination in the United Kingdom).

The Cochrane Central Register of Controlled Trials (CENTRAL) (the Cochrane Collaboration's register of controlled trials, providing bibliographic information on over 600,000 reports of trials identified by contributors to the Cochrane Collaboration).

Databases of methodological issues relating to systematic reviews, economic evaluations and health technology assessments are also available.

III. The Cochrane Oral Health Group (COHG)[7]

(http://www.ohg.cochrane.org/)

The Cochrane Oral Health Review Group comprises an international network of health care professionals, researchers, and consumers preparing, maintaining, and disseminating systematic reviews of randomized controlled trials in oral health. Oral health is broadly conceived to include the prevention, treatment, and rehabilitation of oral, dental and craniofacial diseases and disorders. The COHG was registered with the Cochrane Collaboration in June 1994. The editorial base was initially set up in the United States under the coordinating editorship of Alexia Antczak Bouckoms. In August 1996, the editorial base was transferred to Manchester within the University's School of Dentistry, with Bill Shaw and Helen Worthington as coordinating editors. The COHG aims to produce systematic reviews that primarily include all RCT of oral health.

The Group also maintains a Trials Register that is submitted every quarter for publication in the CENTRAL on The Cochrane Library. There is a process within Cochrane where the new trials in CENTRAL are fed back to MEDLINE to ensure that trials have been correctly indexed in MEDLINE. The work of the COHG is carried out by over 624 members from 40 different countries around the world.

Members contribute to the Group in many different ways:

- Preparing systematic reviews, peer reviewing
- Manually searching journals
- Translating articles
- Offering consumer input.

The activities of the COHG are coordinated and supported by the editorial team located at the editorial base at the School of Dentistry, The University of Manchester, United Kingdom.

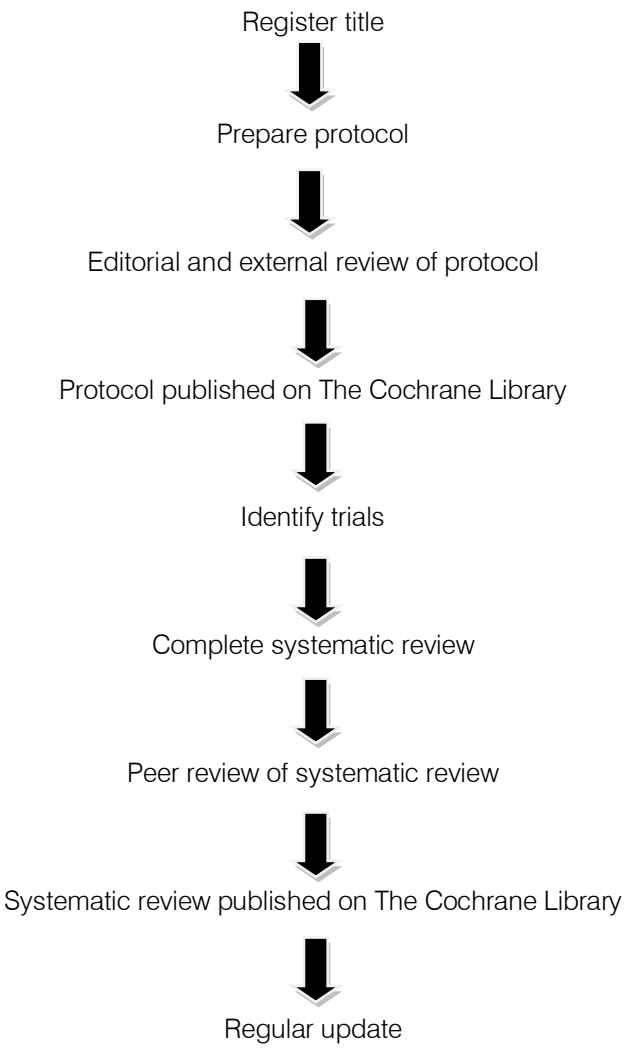

Figure 2: The COHG has an editorial process as outlined below

Randomized controlled trials, which satisfy the inclusion criteria, are usually included in Cochrane reviews of interventions. Some reviews will also include quasi-randomized trials when methods such as alternate allocation have been used to allocate patients to groups.

The inclusion criteria for trials relate to the objectives of the review and use a PICO format which includes specific criteria defining

- P (patient problem)
- I (intervention)
- C (comparison)
- (outcomes)

Randomized trials may therefore be excluded if they include a patient group different to the one specified, different interventions, or do not include any of the outcomes of interest. One of the key dimensions in considering whether a study is valid relates to whether it answers its research question "correctly," that is, in a manner free from bias. This is often described as "internal validity" or "quality." Therefore, it is appropriate to consider risk of bias when assessing studies. This is done by addressing six specific domains: sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting, and other sources of bias.

IV. Levels of Evidence (Figure 3)

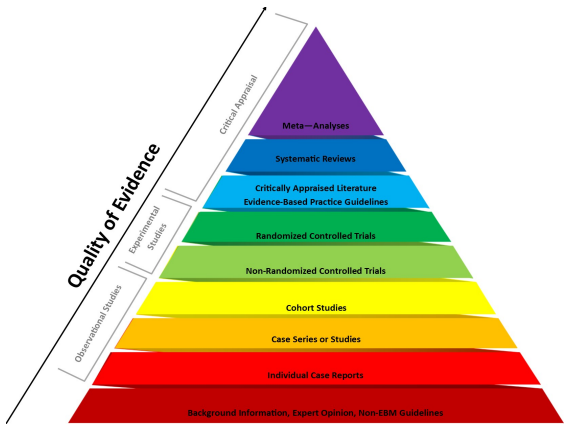

Figure 3: Hierarchy levels of evidence (in descending order of evidence strength)

The highest level of evidence or the "Gold standard" is the systematic review and meta analysis using two or more randomized controlled trials of human subjects.

Systematic reviews and meta analysis are considered the gold standard for evidence because of their strict protocols to reduce bias. These reviews provide a summary of multiple research studies that have investigated the same specific question. Systematic reviews use explicit criteria for retrieval, assessment, and synthesis of evidence from individual RCT's and other well controlled methods.

The hierarchy of evidence is based on the concept of causation and the need to control bias. Although each level may contribute to the total body of knowledge, "not all levels are equally useful for making patient care decisions". In progressing up the pyramid, the number of studies and correspondingly the amount of available literature decreases, while at the same time their relevance to answering clinical questions increases.

V. Conclusion

In order to undertake a study, a proper methodology which is systematic and incorporates theoretical analysis of the methods applied to the field of research is mandatory. In today's arena of healthcare learning, incorporating evidence based research into everyday practice is one of the most important skills to the learnt and hence appropriate knowledge this field is of prime importance.

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The Current Role of Woodman's Arytenoidectomy in Treating Bilateral Abductor Vocal Cord Palsy

By Satish Chandra T., Sudhakar Rao M., Sameera G., Satyanarayana MVN & Lavanya V.

Dr. Pinnamaneni Institute of Medical Sciences and Research Foundation

Abstract- Bilateral abductor vocal cord palsy is one of the most complex laryngeal condition which an otolaryngologist do encounter in their routine practice. Complexity because of the various etiological factors which can affect neurological component anywhere from cerebral cortex to superior mediastinum or local factors like cricoarytenoid fixation. The treatment option is to establish the airway without compromising the voice and lower airway protection from aspiration. Various surgical options have evolved in due course of time ranging from open procedures to laser endoscopic procedures.

Objectives: Evaluating the role external arytenoidectomy (woodman's) in the treatment of bilateral abductor vocal cord paralysis.

Materials and methods: It's a retrospective study including 15 cases of bilateral abductor vocal cord palsy of various etiologies varying from congenital to iatrogenic ones.

Keywords: bilateral abductor vocal cord palsy (bavcp), woodman's arytenoidectomy, laterofixation, vocal fold immobility.

GJMR-J Classification: NLMC Code: WV 530

Strictly as per the compliance and regulations of:

The Current Role of Woodman's Arytenoidectomy in Treating Bilateral Abductor Vocal Cord Palsy

Satish Chandra T. [α], Sudhakar Rao M. [σ], Sameera G. [ρ], Satyanarayana MVN [Ω] & Lavanya V. [¥]

Abstract- Bilateral abductor vocal cord palsy is one of the most complex laryngeal condition which an otolaryngologist do encounter in their routine practice. Complexity because of the various etiological factors which can affect neurological component anywhere from cerebral cortex to superior mediastinum or local factors like cricoarytenoid fixation. The treatment option is to establish the airway without compromising the voice and lower airway protection from aspiration. Various surgical options have evolved in due course of time ranging from open procedures to laser endoscopic procedures.

Objectives: Evaluating the role external arytenoidectomy (woodman's) in the treatment of bilateral abductor vocal cord paralysis.

Materials and methods: It's a retrospective study including 15 cases of bilateral abductor vocal cord palsy of various etiologies varying from congenital to iatrogenic ones.

Results: Study included 8 cases of iatrogenic, 4 cases of pediatric (congenital), and 3 cases of idiopathic bilateral vocal cord paralysis. All the patients were treated by external woodman's arytenoidectomy with successful decannulation. All the patients are followed for a period of 2 years with excellent outcome.

Conclusion: Woodman's arytenoidectomy with laterofixation of vocal cord is equally effective procedure for treating bilateral abductor vocal cord palsy when compared with endoscopic procedures.

Keywords: bilateral abductor vocal cord palsy (bavcp), woodman's arytenoidectomy, laterofixation, vocal fold immobility.

I. Introduction

Vocal fold immobility is the term that describes restricted movement of vocal folds secondary to mechanical fixation or neurological involvement. Mobility of the vocal folds may be decreased or absent, and it may be unilateral or bilateral. From the standpoint of the etiology, choice of treatment, and prognosis, it is important to differentiate between hypomobility and immobility, as well as unilateral or bilateral involvement[1].

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Bilateral abductor palsy of vocal cords results from either damage to the recurrent laryngeal nerves of both sides or fixation of bilateral cricoarytenoid joints. Dysfunction of recurrent laryngeal nerves may result from either trauma to the nerve or any mass affecting the nerve in the neck or mediastinum or even lesions in the floor of the 4th ventricle or brainstem (congenital or acquired)which can affect the both vagal nuclei. However, in many cases no definite cause can be found and these are described as idiopathic.

The patients with bilateral abductor cord palsy usually present with breathing difficulties either with stridor or partial difficulty in breathing as both the cords tend to lie in median or paramedian position. These patients do not have any problem with their voice or aspiration. Some of these patients need immediate surgical intervention due to acute respiratory insufficiency. Other patients can bear light to moderate dyspnea for a long period with no need of therapy.

Tracheostomy can solve dyspnea problems, by sustaining good tone and air passages protection, although it is not well accepted by many patients as long-term solution. Therapeutic procedures in these cases are challenging for the otolaryngologist as it requires to establish the laryngeal airway, without disturbing the sphincteric function of the larynx and preserving quality of voice.

A number of surgical procedures have been described for improvement of the compromised airway in bilateral abductor palsy.JacksoN[2], in 1922, suggested ventriculocordectomy technique through external approach. In 1946, Woodman[3] suggested arytenoidectomy through extralayngeal approach along with suturing of the vocal process to inferior horn of thyroid cartilage. Endolaryngeal accesses were introduced in 1948 by Thornell[4], who proposed arytenoidectomy with electric cautery. Arytenoidectomy and posterior cordotomy performed using CO_2 laser was introduced by Ossoff et al [5, 6] and by Dennis and Kashima[7].

Current study is a retrospective study of 15 patients of bavcp with various etiologies who were treated with tracheostomy followed by woodman's procedure. All the patients were evaluated for the time taken for successful decannulation of tracheostomy and

range of change in pitch of their voice and recurrence over a period of 2 years.

II. Materials and Methods

This is the retrospective study, which included 15 patients from 2013 to 2015.These are the patients who presented to our department directly or referred by other departments with history of stridor or breathing difficulty. The patients with bilateral abductor vocal cord palsy secondary to malignancy were excluded (like esophageal, mediastinal mass, thyroid) from the study. Only the patients who were proven to be idiopathic & secondary to iatrogenic etiology and without any underlying progressive disease were included in our study. All the 7 patients who presented without any iatrogenic history are thoroughly investigated from skull base to mediastinum to rule out all the probable etiologies. The investigatory protocol included CT scan from skull base to mediastinum, upper GI scopey, chest x-ray. In pediatric patients to rule out intracranial pathologies MRI was done.

The treatment protocol we adopted is primary tracheostomy followed by external arytenoidectomy (Woodman's) and decannulation starting from 4thpost-operative day. Woodman[3] in 1946, introduced this technique which is still popular till date. He concluded that a satisfactory airway and a fair voice can be preserved when the posterior commissure is between 4-6 mm.

a) Procedure

Under general anesthesia, tracheostomy done if prior tracheostomy is not there,

- A Vertical incision is given parallel to anterior border of sternocleidomastoid muscle from the level of the upper border of thyroid cartilage to lower border of cricoid cartilage.
- Platysma muscle is incised.
- Strap muscles separated, if required omohyoid is divided.
- Larynx is tilted anteriorly by retracting the thyroid cartilage.
- Inferior constrictor muscle has been separated from thyroid cartilage along with perichondrium.
- If required removed a small portion of posterior part of thyroid cartilage.
- Cricoid cartilage is identified and followed posteriorly.
- After dislocating cricothyroid joint, the posterior and lateral cricoarytenoid muscles are then detached from muscular process of arytenoid cartilage. Arytenoid is resected leaving a small piece if vocal process behind.
- The vocal process of arytenoid was exposed and sutured to thyroid ala.
- The final degree of tightening of this suture is determined by direct laryngoscopy.
- Wound closure done in layers.

Postoperatively the patients were followed with video laryngoscopy. Waited till the surgical edema subsided before planning for decannulation from 4th day onwards.

b) Results

Current series included 15 patients, age ranging from 3-60 yrs.

Table 1

Age	
2-10	3
10-25	2
25-50	6
>50	4

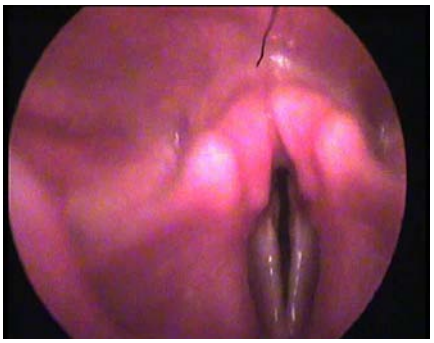
The youngest patient in our study was 3 years girl baby presented with h/o noisy breathing since birth worsening during upper respiratory tract infections, one of such episode led to sever stridor and referred to us by our pediatric department. Two of the pediatric patients also underwent one or more instances of intubation for the same complaint.

Etiological factors include iatrogenic in 8 and idiopathic in 7 shown in table 2.

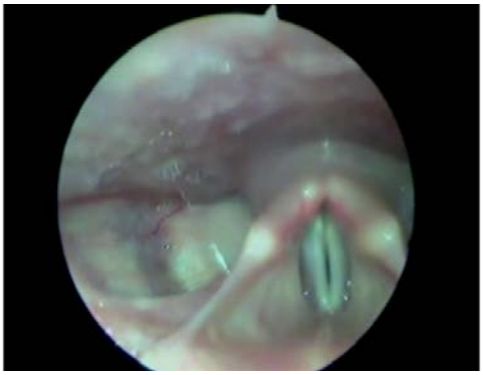
Table 2

Etiology	
Congenital/idiopathic	4
Iatrogenic	8
Cns /idiopathic	3

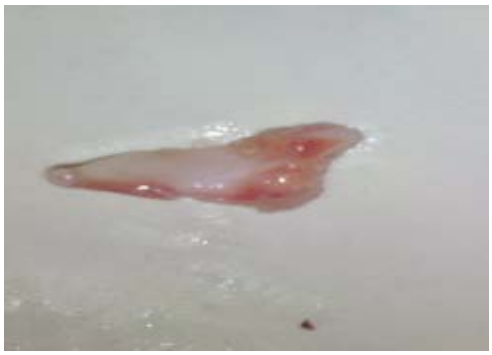
Most of the patients in pediatric age group are with idiopathic etiology, even after thorough investigation we couldn't find out any pathology. Among all 15 patients, 7 of them are presented with severe stridor who immediately underwent emergency tracheostomy. Rest all the 8 patients presented with nocturnal snoring and dyspnea on exertion.

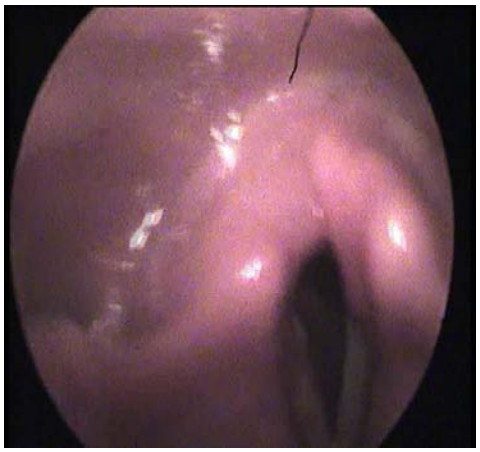


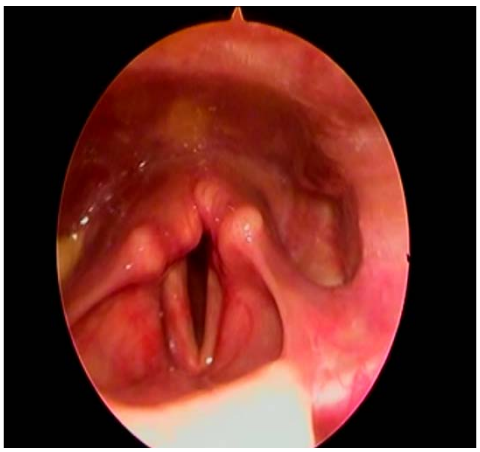
Picture 1: Pre-opendoscopic images

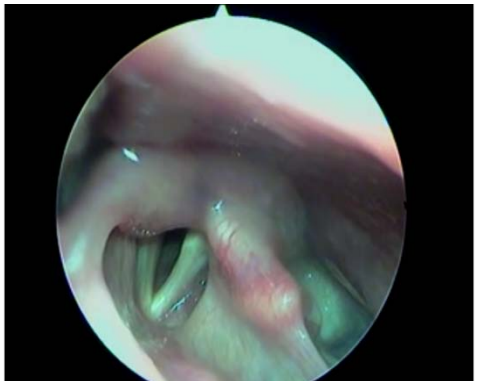


Picture 2: Arytenoid specimen









Picture 3: Post op images

III. Results

We were able to decannulate all the patients from tracheostomy as early as 4th to 7th day with acceptable voice. Out of all the 15 patients, 2 patients complained mild aspiration starting from 4th day in immediate post op period which eventually subsided on its own over next few days with swallowing therapy. Those 2 patients developed bavcp secondary to the total thyroidectomy.

All the patients are followed for more than 2 years. None of them have any recurrent symptoms and relatively with better voice quality. None of them showed any cicatricial contraction with obvious success rate of 100%.

IV. Discussion

Bilateral abductor vocal cord paralysis increases the airway resistance leading to persistent dyspnea because the median or paramedian position of the vocal cords. Final positioning of the vocal cords is dependent on the activity of the cricothyroid muscle, condition of the denervatedvocalis muscle, condition of the cricoarytenoid joint, change in the epithelium of the vocal folds in an attempt to adapt to the compromised air way.[10]

Aim of the treatment of bilateral abductor vocal cord palsy is to relieve the obstruction either by bypassing or widening the narrow area. At the same time preserving the voice and preventing the aspiration are also important. Tracheostomy being the life saving procedure may not be the final option as most of them don't want lifelong tracheostomy. Wide range of surgical options available to achieve this.

No operation should be attempted until at least 2 months after onset of paralysis, where etiology of the paralysis is known thus allowing for possibility of any spontaneous recovery.[8] The technique for increasing the airway caliber involves lateralization of one vocal fold/removal of tissue from posterior glottis. Work by Hirano and colleagues has shown that the posterior glottis accounts for 50-65% area of the total glottis and

thus enlarging the posterior glottis, has a greater effect on the airway while preserving the voice quality.[8]

Woodman in 1946 introduced the technique of extra laryngeal approach for the excision of arytenoid along with laterofixation of vocal cord to the inferior cornu of thyroid cartilage. He stated in his article that a satisfactory airway along with good voice can be achieved with a gap of 4 to 6mm in posterior commissure.[3]

In the current study we performed woodman's procedure in 15 patients with successful decannulation in all the patients with a span of 4 to 9 days. Excision of the arytenoid with lateralization of the same cord by pulling it laterally, by placing a stitch form vocal process to thyroid cartilage, under direct visualization of the glottis with direct laryngoscopy, to secure the desired lateral position of the cord is the key to the successes. We made sure mucosa was not traumatized while doing the procedure. Prabir Kumar Mondalin their study of surgical management of Bilateral abductor paralysis by extra laryngeal approach had similar results.[8]

Brigger and Hartnick in their stated that "open" procedures seem to be the most effective primary treatment for bilateral VCP in children. Both external arytenoidopexy and external arytenoidectomy demonstrated similar operation specific decannulation rates. Minimally invasive or endoscopic CO2 laser arytenoidectomies performed as a primary intervention do not appear to be as efficacious as "open" procedures as a primary intervention.[9] It has been postulated that one reason for decreased efficacy of CO2 laser ablation within the pediatric larynx is the smaller scale of the anatomic landmarks and obstruction of the posterior glottis by a flaccid aryepiglottic fold.[11]

In the current study we did Woodman's procedure in 4 pediatric patients, youngest being 3 yrs. We were able to decannulate all of them with acceptable voice. Mucosal sparing external procedures have an advantage over the intraluminal mucosal handling procedures in pediatric patients as the later always has a chance of fibrosis, contractures and probability of posterior glottic stenosis. Removal of the arytenoid and fixing the cord laterally without traumatizing the laryngeal mucosa especially interarytenoid area always holds good for pediatric patients.

Complications like perichondritis of the arytenoids, granuloma formation, explosion burns by laser are less with Woodman's procedure.

V. Conclusion

Bilateral abductor palsy of vocal cords is a life-threatening condition. Wide ranges of surgical procedures are evolved over a period of time. Endoscopic laser posterior cordotomy or Kashima's surgery is considered to be the choice of treatment for bilateral vocal cord palsy. Woodman's procedure is one of the oldest procedure initially reported way back 1946. Even though this is an external approach in experienced hands can be very successful one as it allows the surgeon to control the degree of lateralization of the cord intraoperatively under vision, and the problems of adverse glottic scarring can be avoided.[10]

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Comparative Study of Immediate and Delayed Lateral Ridge Expansion Technique in the Atrophic Posterior Mandibular Ridge

By Viswambaran M, Verma Kamal, Desai A P & Yadav Rajesh Kumar

Abstract- *Background:* This study was undertaken to comparatively analyse the immediate and delayed ridge expansion techniques for early prosthetic rehabilitation in patients with atrophic posterior edentulous mandibular region.

Material and Methods: Patients reporting for replacement of mandibular posterior teeth were included in the study. The forty patients were randomly selected and divided into two groups of twenty each: Group-I patients undergoing immediate ridge expansion along with placement of implants and Group-II patients undergoing delayed (staged) ridge expansion with placement of implants. Implants were loaded in a conventional manner after six months. Crestal bone loss(six and twelve months post implant placement) and bone width gain (base line and post operative) was assessed. Crestal bone loss was evaluated using standardised radiographs using radiovisiograph (RVG). Bone width was evaluated using Cone Beam CT.

Keywords: *ridge expansion, alveolar ridge split, crestal bone loss.*

GJMR-J Classification: *NLMC Code: WU 500*

Strictly as per the compliance and regulations of:

Comparative Study of Immediate and Delayed Lateral Ridge Expansion Technique in the Atrophic Posterior Mandibular Ridge

Viswambaran M [α], Verma Kamal [σ], Desai A P [ρ] & Yadav Rajesh Kumar [ω]

Abstract- Background: This study was undertaken to comparatively analyse the immediate and delayed ridge expansion techniques for early prosthetic rehabilitation in patients with atrophic posterior edentulous mandibular region.

Material and Methods: Patients reporting for replacement of mandibular posterior teeth were included in the study. The forty patients were randomly selected and divided into two groups of twenty each: Group-I patients undergoing immediate ridge expansion along with placement of implants and Group-II patients undergoing delayed (staged) ridge expansion with placement of implants. Implants were loaded in a conventional manner after six months. Crestal bone loss(six and twelve months post implant placement) and bone width gain (base line and post operative) was assessed. Crestal bone loss was evaluated using standardised radiographs using radiovisiograph (RVG). Bone width was evaluated using Cone Beam CT.

Results: The mean bone width was increased both in Immediate Ridge Expansion (IRE) and Delayed Ridge Expansion (DRE) techniques by 3.16 units and by 3.095 respectively indicating comparable bone gain in both the techniques. Mean bone losses are 0.5063 and 0.4950 respectively. Based on the parameters evaluated, both the techniques found to be successful and comparable without any major complications. Alveolar ridge split technique together with adequately designed implants are useful for solving cases with bone that is atrophic in width.

Conclusion: The present study demonstrated that all the implants placed in the bone gap created by ridge expansion were successfully osseo integrated. Hard as well as soft tissue structures revealed favourable and stable results with a follow-up period of one year. Alveolar ridge splitting might be considered a predictable approach that demonstrates a high implant survival rate, adequate horizontal bone gain, and minimal intra and postoperative complications.

Keywords: ridge expansion, alveolar ridge split, crestal bone loss.

I. Introduction

Dental implants provide a novel method of successful and predictable treatment of partial or complete edentulism. The resorption of alveolar bone is a common sequel of tooth loss and presents a clinical problem for implant placement. Implants must be placed with at least 1mm of bone on the buccal and lingual aspects in order to maintain crestal bone levels. [1]The pattern and degree of dimensional changes that occur in the alveolar ridge after tooth extraction has been documented in the literature for more than 50 years. [2, 3 & 4]

There is a disproportionate resorption of the buccal plate as compared to the palatal/lingual plate of the ridge with the buccal plate undergoing significantly more resorption.[6] The final outcome of this is not only narrowing of the ridge but a palatal/lingual shift of the mid-line of the ridge. Lekovic et al reported that loss of width was three times greater than the loss of height. [5] Substantial tissue loss leads to increased difficulty in placing the implant fixture in a prosthodontically suitable position.

The lateral ridge expansion technique is usually performed simultaneously with implant placement and significantly shortens the treatment time. This technique is aimed at creating new implant bed by performing longitudinal osteotomy. This technique is usually recommended for atrophic maxillary ridge. Studies related to the posterior mandibular segment are limited. Though the literature recommends immediate and delayed ridge expansion techniques, it is not clear which technique is superior and comparative studies are not available. In view of the above, the present study was undertaken to comparatively analyse the immediate and delayed ridge expansion technique in posterior edentulous mandibular region in armed forces personnel and their dependents for early prosthetic rehabilitation.

II. Material and Methods

Patients reporting for replacement of mandibular posterior teeth were included in the study. The total sample size was 40. The patients were randomlyselected and divided into two groups of twenty each: Group-I patients undergoing immediate ridge expansion along with placement of implants and Group-II patients undergoing delayed(staged) ridge expansion with placement of implants. Implants were loaded in a conventional manner after six months. Crestal bone loss(six and twelve months post implant placement) and bone width gain(base line and post operative) was

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assessed. Crestal bone loss was evaluated using standardised radiographs using radiovisiograph (RVG). Bone width was evaluated using Cone Beam CT.

a) Inclusion criteria

- Patients with missing teeth in the mandibular posterior region with atrophic ridges with width <5mm and adequate height.
- Patients with at least 18 years of age and should be systematically healthy.
- A period of bone healing of at least one year after tooth extraction.
- Able to understand the study procedure and provide signed informed consent.

b) Exclusion criteria

- Systemic disorders tending to affect the surgical intervention and outcome.
- Irradiation in the head and neck area.
- Patients with bruxism and untreated chronic periodontitis.
- Patients with poor oral hygiene and smokers.
- Exhibiting excessive vertical ridge resorption that requires vertical augmentation.
- Presently on IV bisphosphonates or having taken long term oral bisphosphonates for more than three years.

Before starting with the treatment, preliminary diagnosis and treatment planning procedures were carried out.

c) Group 1 (Lateral ridge expansion technique)

Detailed medical and dental history was recorded and cone beam computed tomography was performed to gauge the bone quality and estimate the amount of available bone. Preoperatively the bone width was also evaluated using calipers and bone mapping. Routine blood and urine investigations were carried out before the surgical procedures. The procedures were explained in detail to the patient after diagnosis and treatment planning and informed consent was obtained. Surgery was performed under local anaesthesia under strict aseptic conditions. The first surgical procedure involved a simple corticotomy at the crestal and buccal aspect of the edentulous ridge. A full thickness muco-periosteal flap was raised exposing the buccal aspect of the mandibular alveolar ridge. Crestal osteotomy was done using Piezo surgical device (Piezon Master Surgery®, Nyon, Switzerland). The horizontal osteotomy was started 2 mm away from the adjacent tooth. The caudal ends of the vertical cuts were connected with a horizontal corticotomy. All osteotomies were 3 to 4mm in depth, thereby only the cortical bone was dissected, and the cancellous bone was not significantly affected. Subsequent to this, further bone split and expansion was carried out using MCT ridge splitting and bone expander kit (MCT, Korea) (Figure 1). Approximately 3 to 4mm of expansion was achieved which was measured intra-operatively using surgical caliper which was also later confirmed using post operative cone beam tomography. AB™ (A.B. Dental, Israel) implants were placed following manufacturer's instructions (Figure 2). Interpositional graft used was synthetic bone graft, NovaBone® (Novabone Dental, Atlantic Blvd, USA).

Tension free soft tissue closure was achieved using 4-0 non resorbable sutures. Sutures were removed after seven days and loading protocols was done in the convnetional manner. After six months, the surgical site was evaluated both clinically and radiographically for osseointegration. Second stage surgery was performed and rotine laboratory procedures were carried out for porcelain fused to metal crown following manufacturers instructions and crown cemented using Type 1 glass ionmer cement (GC Fuji, Japan).

d) Group II (Delayed/Staged ridge expansion with placement of implants)

The first step involved a simple corticotomy at the crestal, buccal aspect of the edentulous segment performed under local anaesthesia. After crestal and intracrevicular incisions had been made around the buccal aspects of the adjacent teeth, a mucoperiosteal flap was elevated to expose the buccal aspect of the mandible. Crestal corticotomy line cut into the alveolar ridge was done by using piezosurgical device (Piezon Master Surgery®, Nyon, Switzerland). On the proximal and distal ends of the crestal corticotomy,vertical cuts were made on the buccal cortical plate. The caudal ends of the vertical cuts were connected with horizontal corticotomy (Figure 3). All osteotomies were 3 to 4 mm in depth, thereby only the cortical bone was dissected, and the cancellous bone was not significantly affected. The mucoperiosteal flap was repositioned and fixed with 4-0 nonresorbable sutures.

The second step included splitting and lateralisation of the pedicled buccal bone segment 40 days after the primary step. A crestal and intracrevicular incision around the lingual aspect of the adjacent teeth was performed to expose the area of the crestal osteotomy and to elevate a lingual full thickness flap. A microscalpel was used as a chisel to separate the cortical plates from one another. Care was taken to leave the buccal periosteum attached to the buccal cortical plate. Gradual lateralisation of the buccal segment was performed with a series of bone expanders (Figure 4a) after green stick fracture at the base of the cortical segment untill a 3 to 5mm gap was established between the bone plates. Implant beds were prepared conventionally but without damage to the crestal bone, and dental implants AB™ (A. B. Dental, Israel) were placed in the preplanned positions (Figure 4b). The gap between the implants and cortical plates was filled with NovaBone®. The submerged implants were allowed to heal for six months before

uncovering and prosthetic loading. Prosthetic loading was done in the similar manner described for Group I.

CBCT was done before and after surgical procedure to evaluate bone width gain (Figure 5). Data generated were subjected to statistical analysis. RVG was taken using the long cone paralleling technique and assessed at the time of implant placement, 6 months and 12 months post implant placement. Radiographs were taken following manufacturers recommendations with the grid. The bone level and amount of bone resorption was measured from the crestal bone level to the implant crest module at mesial and distal sites. This was done at the time of implant placement, six months and 12 months (Figure 6) post implant placement. Data collected were subjected to statistical analysis.

III. Results

Table -1 and Table -2 shows pretreatment and post treatment bone width values for Group I and Group II respectively. We have used MINITAB1513 for analyzing the data. For statistical comparisons $P \leq 0.05$ indicates that difference is statistically significant. Table-3 and Graph 1 gives mean and standard deviation for Bone Width with respect to pretreatment and post treatment time points for both the groups namely Immediate Ridge Expansion (IRE) and Delayed Ridge Expansion (DRE). In IRE group the Pretreatment values are 4.085 ± 0.24978 whereas the post treatment values are 7.245 ± 0.28373. Mean bone width has increased by 3.16 units. In IRE group, the Pretreatment values are 4.195 ± 0.24809 whereas the post treatment values are 7.29 ± 0.28818.

Table 4 and Graph 2 reflects mean and standard deviation for crestalbone loss for the two groups by sites t. e. (Mesial and Distal) and periods i.e. 6 months and 12 months respectively. Between the treatment groups mean bone losses appear to be practically equal within sites and also within periods. Between periods mean bone losses are higher in 12 months period compared to the 6 month period for each site numerically.

The descriptive statistics for bone width for the groups ignoring treatment points (pre and post) based on 40 observations each. For IRE bone width varies from a minimum of 3.7 to a maximum of 7.80 with mean $\pm$ standard deviation as 5.66 ± 1.62. For DRE bone width varies from a minimum of 3.8 to a maximum of 7.80 with mean $\pm$ standard deviation as 5.74 ± 1.59. The descriptive statistics for bone width for the treatment points ignoring the groups based on 40 observations each. For pretreatment time point bone width varies from a minimum of 3.70 to a maximum of 4.76 with mean $\pm$ standard deviation as 4.14 ± 10.2530. For post treatment time bone width varies from a minimum of 6.80 to a maximum of 7.80 with mean $\pm$ standard deviation as 7.27 ± 0.2832 there is a mean increase of 3.13 from pre to post numerically.

Table 5 and Graph 3 presents descriptive statistics regarding groups ignoring sites and periods based on 80 observations each. For IRE the bone loss varies from a minimum of 0.10 to a maximum of 1.00 whereas for DRE the values vary from a minimum of 0.20 to a maximum of 0.80. Mean bone losses are 0.5063 and 0.4950 respectively. The descriptive statistics regarding periods ignoring sites and groups based on 80 observations each. For the period of 12 months bone loss varies from a minimum of 0.10 to a maximum of 1.00 whereas for that of 6 months the values vary from a minimum of 0.20 to a maximum of 0.80. Mean bone losses are 0.6350 and 0.3663 respectively. The descriptive statistics regarding sites ignoring periods and groups based on 80 observations each. For Distal bone loss varies from a minimum of 0.10 to a maximum of 0.90 whereas for mesial the values vary from a minimum of 0.20 to a maximum of 1.00. Mean bone losses are 0.5313 and 0.4700 respectively.

Table-6 presents Two Factor Analysis of Variance (ANOVA) for bone width. Factors are treatment group at two levels i.e. IRE and DRE) and treatment time also at two levels: Pre and Post. From the ANOVA table we find that there is no interaction between the two factors namely Group and Times ($F = 0.29$, $P = 0.5890$). There is also no statistically significant difference in mean bone width between the two groups ($F = 1.67$, $P = 0.2000$). However difference in mean bone width between the pre and post treatment times is very highly significant ($F = 2721.74$, $P =$ practically zero). The Post treatment Mean bone width higher than that of pretreatment time by 3.73. Table-7 presents Three Factor Analysis of Variance (ANOVA) for bone loss. Factors are treatment group at two levels i.e. IRE and DRE, sites at two levels: Distal and Mesial and Period also at two levels: 6 months and 12 months. From the ANOVA table we find all interactions were not significant. The interactions and related F and P values are as follows: Group X Period: $F = 0.090$, $P = 0.765$; Group X Site: $F = 0.030$, $P = 0.857$; Period X Site: $F = 0.180$, $P = 0.675$ and Group X Period X Site - $F = 0.001$, $P = 0.952$. Here also There is no statistically significant difference in mean bone loss between the two groups: ($F = 0.290$, $P = 0.0569$). However difference in mean bone loss between the two sites as well as the difference between two periods for the same are statistically highly significant: ($F = 8.640$, $P = 0.004$ and $F = 166.31$, $P = 0.00001$ respectively). Mean bone loss for Distal = 0.5313 and for Mesial it is equal to 0.4700. For 12 Months period mean bone loss = 0.6350 and for 6 month it is = 0.3663.

IV. Discussion

Rehabilitation of partial or total edentulism with dental implants has been established as a predictable treatment modality with high success rates. [6-11]

However, insufficient width of the alveolar ridge due to atrophy, periodontal disease or trauma may render implant placement impossible. In such cases, bone grafting, guided bone regeneration, alveolar ridge splitting and combinations of these techniques have been suggested for lateral augmentation of the alveolar ridge prior to implant insertion. In some patients, the use of narrow implants can solve some cases, but when the bone width is 3 mm or less it is not feasible to contemplate the safe and stable installation of dental implants.

Ridge splitting technique is well documented treatment option for augmentation of the bucco-lingual dimension of the alveolar ridge which was first described by Tatum [12]. Compared with guided bone regeneration or bone grafting, the ridge splitting technique enables simultaneous implant placement, eliminates the need for bone harvesting and reduces a risk of graft or membrane exposure. Therefore, the overall treatment time is shortened and morbidity is reduced. [13, 14]. This technique has turn out to be a rational procedure and a 98% to 100% survival rate was reported following the contextual insertion of implants [15].

On the other hand, this technique can be used for horizontal deficiencies, but not for vertical augmentation. Thus, it can be applied for augmentation of alveolar ridges with adequate height. Moreover, the ridge splitting technique necessitates a minimum of 3mm of bucco-lingual width with at least 1 mm of cancellous bone between the 2 cortical plates, which would allow introduction of instruments and the maintenance of good blood supply to the split parts. [16]. Scarano et al. recommended the two-stage technique with conventional loading of the implants, since this might prevent unplanned fracturing of the vestibular wall, reducing complications and obstacles to treatment [17]. In contrast, Shibuya et al. stated that even if a malfracture occurs, a sufficient volume of alveolar bone can be obtained using a free bone segment without rigid fixation and dental implants placed within the malfracture area show a good prognosis [18].

Of the techniques described for SCT, there is no consensus regarding the preferred technique for ridge expansion. But the most commonly employed technique includes immediate lateral ridge expansion along with placement of implants. Delayed (staged) ridge expansion was preferred by only few researchers. Second issue is it is applicability to mandibular ridge. Ridge splitting with bone expansion is a technique of shuffle of bone to form receptor site for implant without removing any bone from the implant site. Maxillary bone has inherent quality of flexibility which can bemolded to desire location by using series of instrument namely chisels and osteotome. But in mandible, the procedure is questionable. Maximum studies are related to maxilla and there are few studies related to mandible.Therefore this study was designed to compare these two techniques in mandibular ridge.

We used NovaBone® (Novabone Dental, Atlantic Blvd, USA) to fill the gaps. NovaBone Putty is a bioactive synthetic graft with osteostimulative and osteocon- ductive property. Spaces between particles of novabone putty permit rapid vascularization and bone ingrowth. This material has been extensively researched and proven material [19]. In our study also this material proved to be effective. Few studies used only resorbable membranes [20]. Some studies did not use any graft or membrane, but nonetheless achieved a high success rate [21]. We preferred to place a resorbable collagen membrane in conjunction with ridge split procedure after bone grafting and found favourable results without any complications.

Alveolar ridge splitting is classically performed by means of chisels and hammer, rotary burs, diamond disk, reciprocal saw and piezoelectric device [22]. The use of bone chisels is time consuming and requires technical skills and a long learning curve. The alveolar ridge split procedure performed with rotating saws orbursis more rapid, but soft tissues and delicate anatomical structures can be damaged; close access to adjacent teeth can be difficult, and there is a high risk of losing control over the cutting device. However, Vercellotti et al. introduced piezo surgery in the treatment of the atrophic jaw. Piezo surgery made split technique safer, effortless and also reduced the risk of complications in the treatment of extreme atrophic crests [23]. Piezosurgery is a reliable procedure with adequate scientific evidence [24] and our study also supports the use of Piezosurgical unit for precise and efficient osteotomy in ridge split and expansion techniques.

One of the main parameters which was evaluated in our study was the bone width gain after ridge split and expansion in relation to both the procedures. There was considerable bone gain after the ridge expansion procedures in our study as reflected in Table1-3 and Chart 1. Both the techniques produced equally good results. In IRE group, the mean bone width has increased by 3.16 units. In DRE group, the mean bone width has increased by nearly the same magnitude i.e. 3.095. This is in agreement with previous studies. Chiapasco M [25] reported an increase in ridge thickness by 2 to 5mm right after the procedure.

The second parameter was the crestal bone changes in relation to both the procedures. Yoon J M et al [26] reported mean marginal bone loss of implants of 1.57±1.44 mm at the mesial side and 1.42±1.48 mm at the distal side. Evaluation of crestal bone levels reflected bone resorption with acceptable limits and in accordance with previous studies. For IRE the bone loss varied from a minimum of 0.10 to a maximum of 1.00 whereas for DRE the values varied from a minimum of

0.20 to a maximum of 0.80. Mean bone losses are 0.5063 and 0.4950.

Clinical trials have reported success rates ranging from 98 to 100%. [27, 28]. The survival rates of implants immediately placed in expanded sites ranged from 91% to 97.3%, while the success rates varied from 86.2% to 98.8%. Whereas in our study the success rate was 100%. One major drawback of alveolar bone splitting is the requirement of a cancellous bone compartment between the buccal and lingual plates to allow separation.

V. Conclusion

The ridge splitting technique seems to be a minimally invasive option for horizontal augmentation of narrow alveolar ridges. Predictable clinical results can be achieved as long as a proper preoperative evaluation is performed and a precise surgical and laboratory protocols are followed. Within the limitations of the current study, the following conclusions were drawn:

1. Use of ridge splitting technique offers great advantage of placing dental implant at same surgical appointment in ≥3 mm of bone width.
2. Based on the parameters evaluated, both the techniques found to be successful and comparable without any major complications. The present study demonstrated that none of the implants placed in the bone gap created by ridge expansion was lost and all were successfully Osseo integrated. Hard as well as soft tissue structures revealed favourable and stable results with a follow-up period of one year.
3. The lateral ridge expansion technique is effective for horizontal augmentation in the severely atrophic posterior mandibular ridge. The delayed lateral ridge expansion technique can be used more safely and predictably in patients with high bone quality and thick cortex and a narrower ridge in the mandible.
4. Future clinical studies with carefully selected patient populations, control groups, and well-documented methodologies are required to adequately assess the performance of the SCT, since the high implant success rates may represent a bias related to patient pre-screening.
5. More well-designed, long-term randomized control trials are required to understand the effect of flap design and immediate implant placement on marginal bone resorption in ridge split done in mandible.

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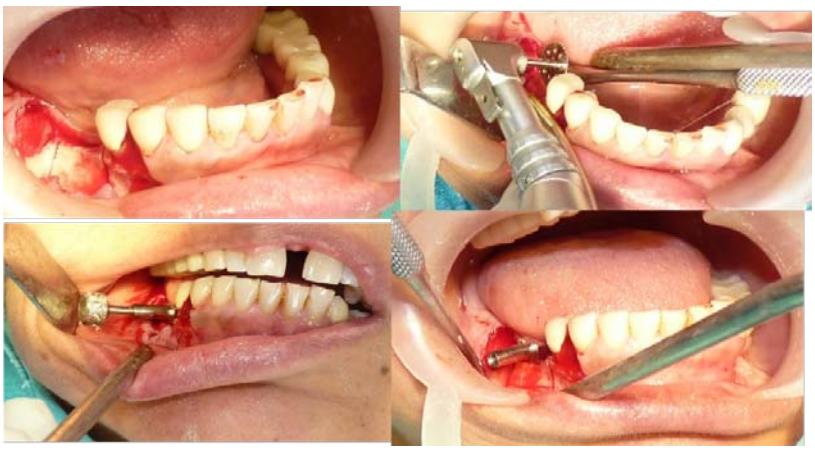


Figure 1: Ridge expansion using split master kit

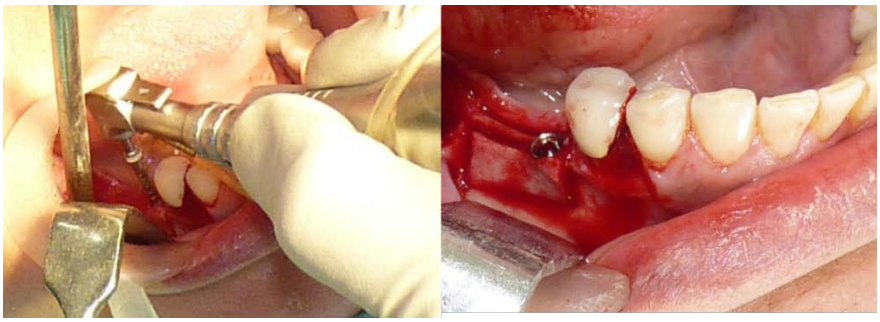


Figure 2: Implant placement after ridge expansion

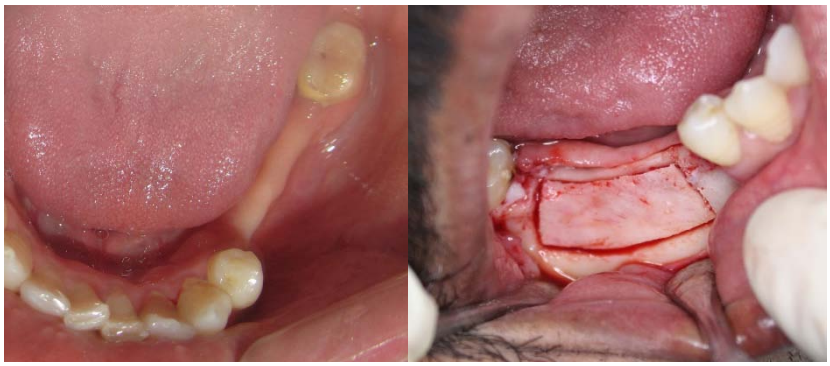


Figure 3: Narrow edentulous ridge requiring expansion (horizontal & vertical corticotomy cuts on the buccal cortical plate)

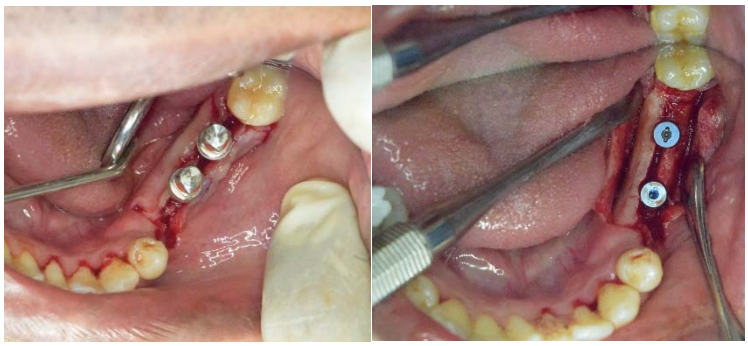


Figure 4: (a): Gradual lateralisation of the buccal segment using bone expanders (b):Placement of implants

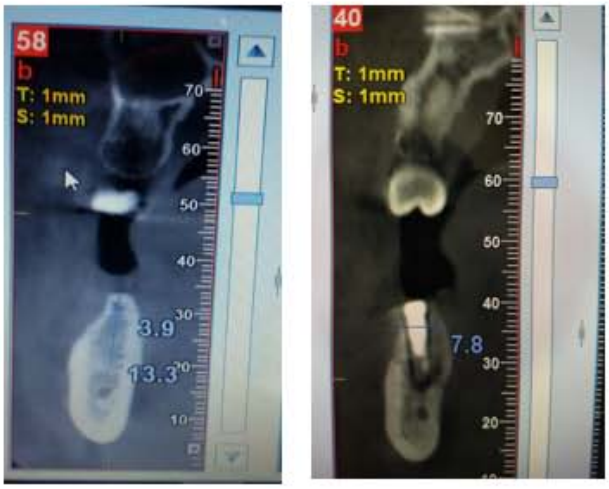


Figure 5: Preoperative and Postoperative CBCT

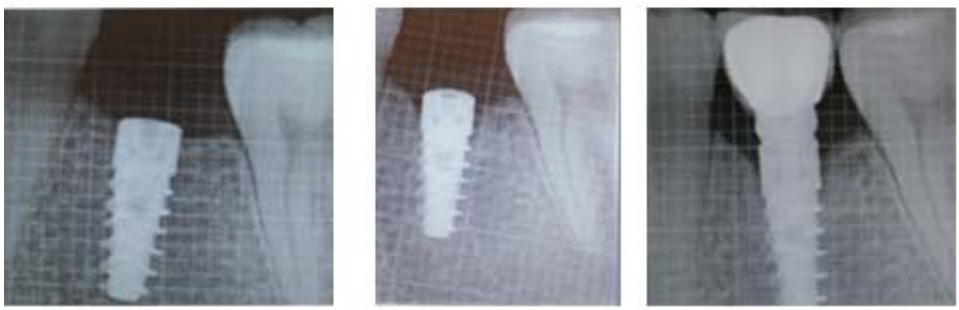
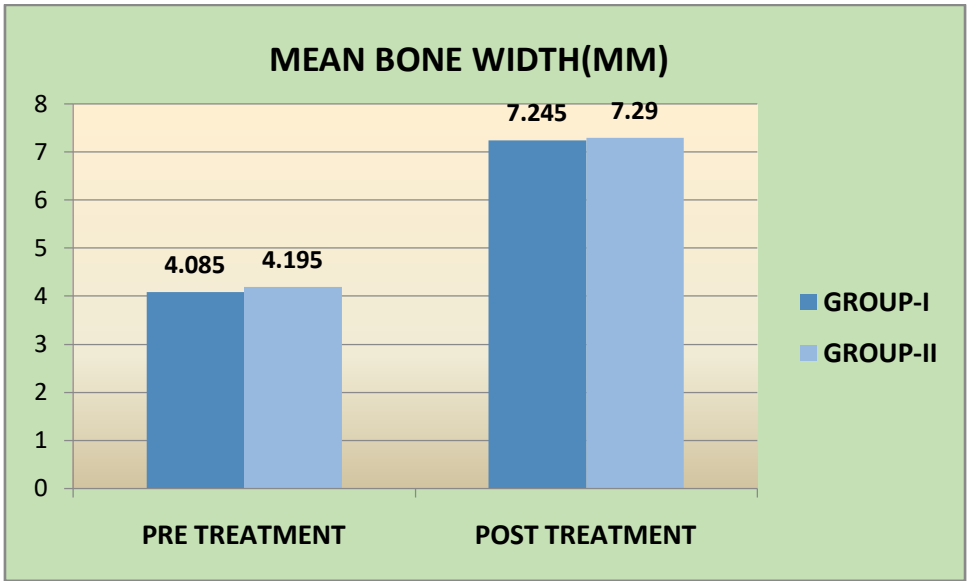
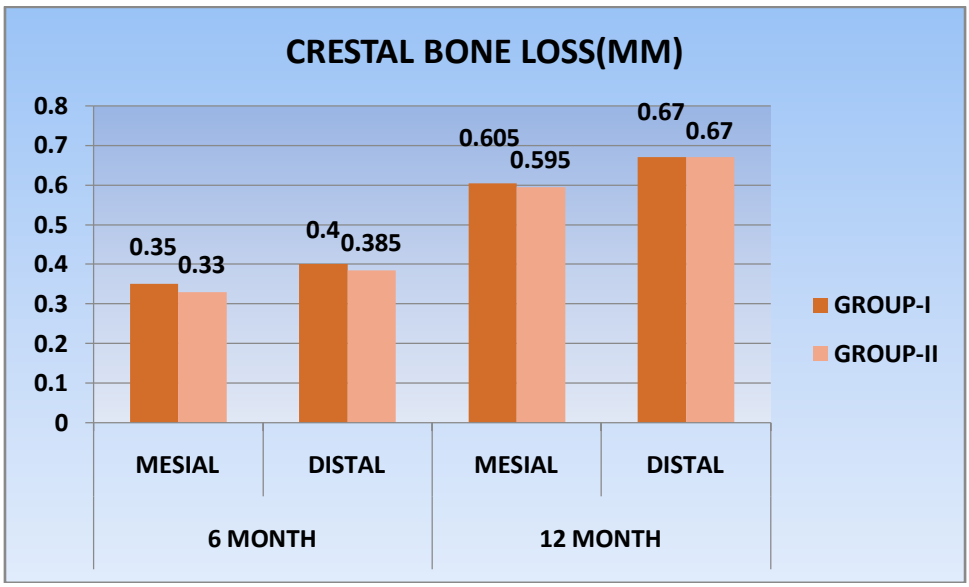


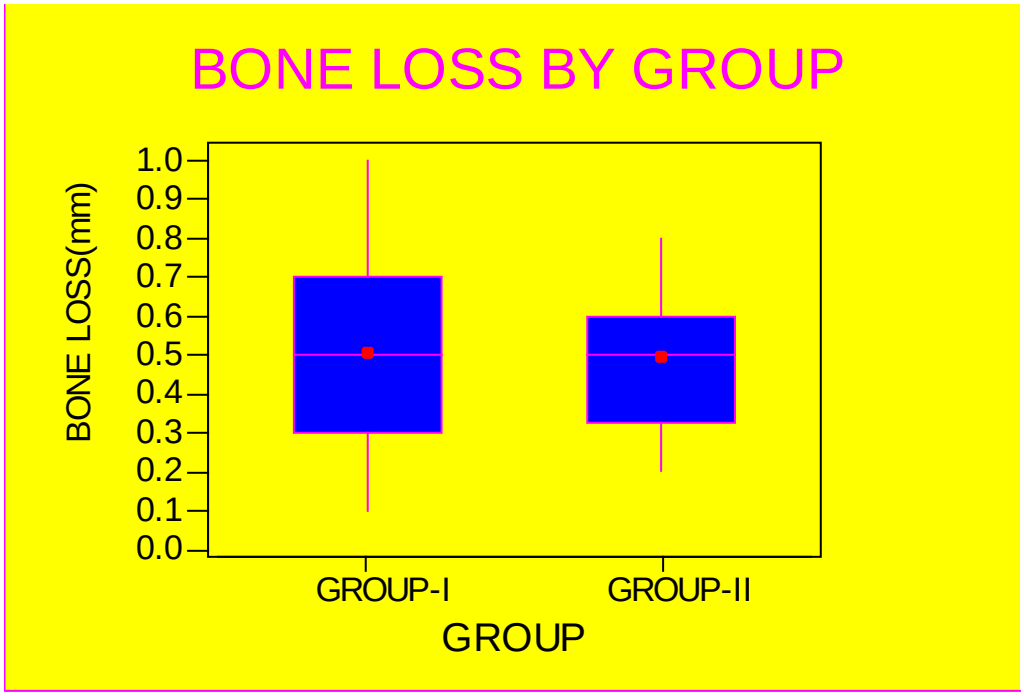
Figure 6: Radiograph with grid immediately, Six months and Twelve months Post operative



Graph 1



Graph 2



Graph 3

Table 1: Group 1: Immediate ridge expansion technique bone width before and after ridge expansion

Case No.	Pre treatment	Post treatment
1	4.0	7.1
2	3.9	7.8
3	4.1	7.7
4	4.2	7.3
5	4.0	7.8
6	3.8	7.0
7	4.0	7.4
8	4.4	7.7
9	4.3	7.0
10	4.0	7.2
11	3.9	7.0
12	3.7	6.9
13	4.6	7.5
14	3.9	7.0
15	4.1	7.1
16	4.0	7.2
17	4.0	7.0
18	4.1	7.3
19	4.0	7.2
20	4.7	6.9

Table 2: Group 11: Delayed ridge expansion technique bone width before and after ridge expansion

Case No.	Pre treatment	Post treatment
1	4.2	7.5
2	3.9	7.4
3	4.1	7.2
4	4.2	7.0
5	3.8	7.1
6	4.3	7.3
7	4.4	7.5
8	4.7	7.0
9	4.1	7.5
10	4.0	7.8
11	4.5	7.4
12	3.9	7.1
13	4.2	7.6
14	4.2	7.1
15	4.4	7.8
16	4.0	6.8
17	4.6	7.3
18	3.9	6.9
19	4.1	7.0
20	4.4	7.5

Table 3: Bone width- group x treatment point

	GROUP-I (IRE)		GROUP-II (DRE)	
	PRE TREAT	POST TREAT	PRE TREAT	POST TREAT
MEAN	4.085	7.245	4.195	7.29
SD	0.24978	0.28373	0.24809	0.28818

Table 4: Crestal bone loss- group x period x site

PERIOD		6 MONTH		12 MONTH	
SITE		MESIAL	DISTAL	MESIAL	DISTAL
GROUP-I	MEAN	0.35	0.4	0.605	0.67
	SD	0.16059	0.15559	0.17313	0.13416
GROUP-II	MEAN	0.33	0.385	0.595	0.67
	SD	0.10311	0.10399	0.10501	0.09234

Table 5: Descriptive statistics: bone-loss by groups

GROUP	N	MEAN	S.D.	MINIMUM	MAXMUM
GROUP-I	80	0.5063	0.2046	0.10	1.00
GROUP-II	80	0.4950	0.1735	0.20	0.80

Table 6: Two factor analysis: bone width

Factor	Type	Levels	Values
Groups	Fixed	2	Group-I, Group-Ii
Pre/Post	Fixed	2	Pre Treatment, Post Tretment

ANOVA

SOURCE	DF	SS	MS	F	P
Group	1	0.102	0.102	1.67	0.2000
Pre / Post Treatment #	1	195.625	195.625	*2721.74*	*0.0000*
Group* Pre/Post	1	0.021	0.021	0.29	0.5890
Error	76	05.462	0.072		
Total	79	201.229			

For this character P-Value is practically ZERO.

Table 7: Three factor analysis: bone loss

Factor	Type	Levels	Values
Group	Fixed	2	Group-I Group-Ii
Period	Fixed	26	Month 12 Month
Site	Fixed	2	Distal Mesial

ANOVA

SOURCE	DF	SS	MS	F	P
Group	1	0.00506	0.00506	0.290	0.590
Period	1	2.88906	2.88906	*166.310*	*0.00001*
Site	1	0.15006	0.15006	*8.640*	*0.004*
Group*Period	1	0.00156	0.00156	0.090	0.765
Group*Site	1	0.00056	0.00056	0.030	0.857
Period*Site	1	0.00306	0.00306	0.180	0.675
Group*Period*Site	1	0.00006	0.00006	0.001	0.952
Error	152	2.64050	0.01737		
Total	159	5.68994			

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Management of Internal Root Resorption with Bioceramic Material on Permanent Tooth- A Case Report

By Dr. Indrajit Biswas, Dr. Saikat Chatterjee, Dr. Niladri Maiti & Dr. Paromita Mazumdar

Abstract- Internal root resorption (IRR) is a particular category of pulp disease characterized by the loss of dentine as a result of the action of clastic cells stimulated by pulpal inflammation. The objective of this case report was to account for the diagnosis and management of an internal root resorption without perforation. The patient, a 26-year-old male, came to Guru Nanak Institute of Dental Sciences and Research, West Bengal, without having symptoms in the tooth. Endodontic treatment was performed using the following methods: irrigation of the root canal with 2.5% of sodium hypochlorite, then calcium hydroxide (CH) was applied as intracanal medicament for one month. Complete instrumentation was done with Hyflex One File (Coltene) and obturation with corresponding guta-percha and Roeko Gutta flow Bio seal sealer (Coltene). The patient was checked after one week and then after six months. He did not have any symptoms and IOPA radiograph did not show any further progression of the lesion.

Keywords: internal root resorption, calcium hydroxide (CH), sodium hypochlorite, MTA.

GJMR-J Classification: NLMC Code: WU 515

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I. Introduction

The Glossary of the American Association of Endodontists, defines internal root resorption (IRR) as a condition associated with a physiological or pathological process that results in the loss of dentin, cement and bone [1].

Most teeth with internal root resorption are symptom free and are first clinically recognized through routine radiographs. However, when resorption actively progresses, the tooth is only partially vital and may present typical symptoms of pulpitis.

Bell (1830) first reported about IRR. Mummery (1920) called it “pink tooth of Mummery” due to the presence of pink discoloration on the crown [2]. This condition, although rare, is more frequent in the male population. The IRR is more common in the presence of a periapical lesion. Its prevalence was estimated between 0.01% and 1% depending on the inflammatory condition of the pulp. [3]

The IRR could be caused by several stimuli: trauma, chronic inflammation of pulp/periodontal ligament, heat created by the friction of drills during the preparation of cavities, cracked tooth syndrome, tooth reimplantation and orthodontic treatment [4]. There have also been reported cases of internal reabsorption caused by Herpes Zoster virus [5].

The IRR is caused by inflammatory stimuli which produce an alteration of the odontoclast inhibitory mechanism resulting in an alteration of the pre-dentine layer. The vascular change in the pulp produces hyperemia increasing oxygen tension, and causing an acidic pH level that attracts multinucleated cells, odontoclasts and dentinoclasts. Dominance of inhibitory substances such as OPG (osteoprotegerin) as activators of RANKL (receptor activator of factor kappa B ligand) followed by swelling, results in the rupture of protective coatings allowing the invasion of odontoclasts and initiating resorptive patterns. Connective, post-resorptive activity tissue transforms into metaplastic granulation tissue. [6]

Generally IRR detection is done by X-rays, however, the use of cone beam computed tomography (CBCT) has been reported to be highly useful for diagnosis in endodontics, since it shows the lesion in detail and includes information about adjacent anatomy, which X-rays does not provide.[7]

The periapical radiography is limited because it provides a two-dimensional image [8], whereas diagnosis by CBCT shows images in all their dimensions through tomographic slices, without image overlay [9]. Also, diagnosis by CBCT may improve the accuracy and efficiency in the prognosis of the tooth [10]

Therapeutically, the biomaterial employed can influence the prognosis of the nonsurgical endodontic treatment done for extensive internal root resorption [11]. MTA is most commonly used in these cases because of its sealing ability, biocompatibility and potential induction of osteogenesis and cement genesis- and also it can be used in a humid environment. [12] Another study using an experimental immature tooth model, demonstrated that the MTA also increased the fracture resistance of bovine incisors

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when submitted to different reinforcement treatments Recently bioceramics are widely used in endodontics. Roeko Gutta flow Bio seal (COLTENE) is a bioceramic endodontic sealer which claims to avoid shrinkage upon setting as it has Zirconium oxide is used as the radiopacifier, and the material is claimed to be aluminum-free, non-soluble and does not shrink during setting. It gives advantage of flow of material as well as sealing ability which better bond with the corresponding gutta percha used for obturation. [13]

The purpose of this case report is to describe the diagnosis and clinical management of an internal root resorption with bioceramic material.

II. Case Report

Male patient, 26 years old, treated at the post graduate department in Guru Nanak Institute of Dental Sciences and Research. The patient reported no pain at the time of appointment the chief complaint was discoloration of the front tooth which was traumatized 5 year back.

Vitality tests using Endo-Ice (Coltene, Switzerland) were performedin #11; the tooth gave negative response. The patient did not present tooth mobility and periodontal pockets.

IOPA radiograph of the affected tooth#11showed an oval enlargement (ballooning out) of the root canal space (Pic: 1). The pulp chamber and canal cannot be followed throughout the lesion. Radiograph performed at different angulation to confirm the resorptive lacunaeis a continuation of the distorted border of the rootcanal.

Endodontic treatment was suggested; therefore, isolation protocol was performed to make the cavity opening later (Pic: 2). Working length of the tooth was determined by IOPA radiograph using #15K file (Pic: 3) and the result was confirmed with apex locator Canal Pro (COLTENE). After removing the pulp tissue properlychemical-mechanical instrumentation was performed with Hyflex One File (COLTENE) and irrigation was done with 1ml of 2.5% of sodium hypochlorite between each time instrumentation with 30-gauge side vented needle. This was followed by irrigation with normal saline to remove any remnants of hypochlorite, later canal was dried with absorbent points.

$Ca(OH)_2$ dressing was given for 1month and the medicament was changed weekly.

After one month, temporary restoration was removed with #4 round diamond bur, canal was irrigated with 5 mL of 2.5% sodium hypochlorite (NaOCl) and 5 mL of 17% of ethylenediaminetetraacetic acid for removing the Ca(OH) dressing and then the canal was flushed with normal saline and dried.

After removing the medication, obturation was done with Hyflex corresponding Gutta Percha and the remaining pulp chamber was obturated with Gutta flow Bio seal sealer (Pic: 4).Access cavity restoration was done with light cure composite resin. The patient was recalled after 6 and 12 months (Pic: 5) for clinical and radiographic follow up. Clinical examination of tooth #11 was functional without sensitivity to percussion or palpation.

III. Discussion

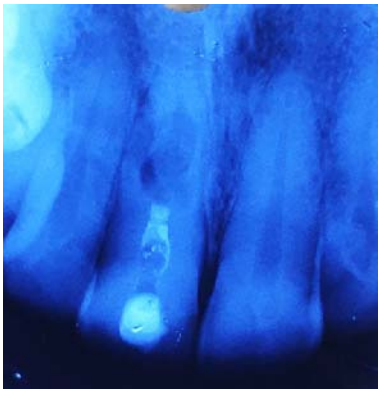
There is always a dilemma of whether to treat a tooth with a questionable prognosis endodontically or extract it and subsequently place an implant. Bell first reported a case on internal resorption in 1830. Since then there have been numerous reports in the literature. [14]

Two types of internal root resorption are generally described: the internal root canal inflammatory resorption and the internal root canal replacement resorption.

In the inflammatory resorption, the resorptive process of the intra-radicular dentin progresses without adjunctive deposition of hard tissues adjacent to the resorptive sites. The phenomenon is associated with the presence of granulation tissues in the resorbed area and identifiable with routine radiographs as are radiolucent zone centered on the root canal. In the replacement resorption, the resorptive activity cause defects in the dentin adjacent to the root canal, with concomitant deposition of bone like tissue in some regions of the defect. It results in an irregular enlargement of the pulp space with partially or fully obliterated area of the pulp chamber.

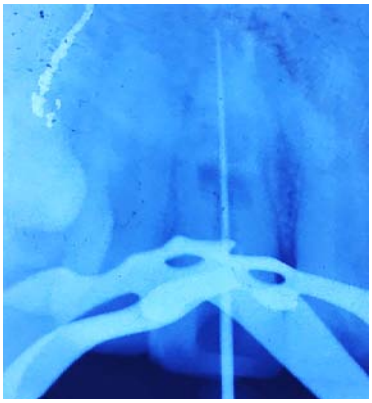
Internal resorption is the result of an inflamed pulp and the clastic precursor cells recruiting through the blood vessels. Treatment of internal resorption is quite predictable as it is easy to control the process of internal root resorption via severing the blood supply to the resorbing tissues with conventional root canal therapy.

Intraoral X-ray of IRR is characterized by the radiographic appearance of an oval shape enlargement within the pulp chamber or the root canal. However the early diagnosis of the IRR is difficult by examination of a conventional X-ray. If IRR is suspected, several shots under different angles of incidence are recommended.

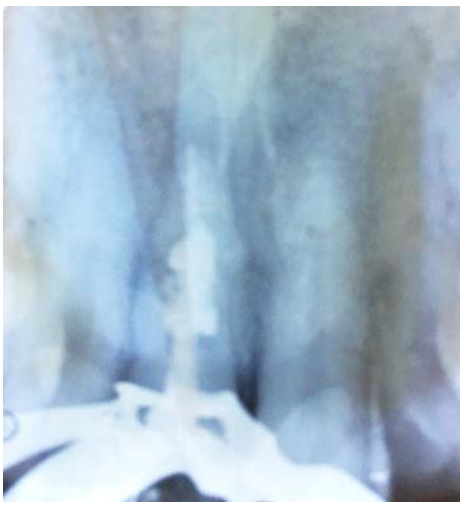


Pic. 1

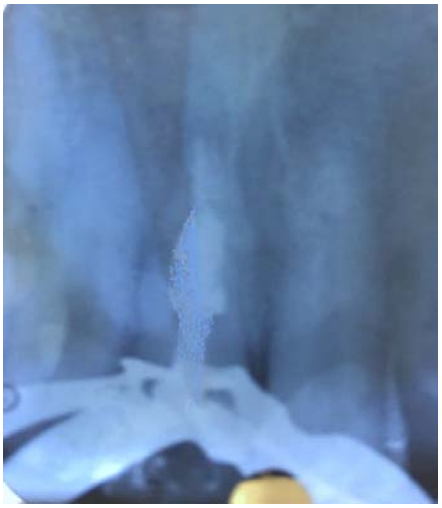
Pic. 2



Pic. 3



Pic. 4



Pic. 5

Pic. 6

In the treatment of internal resorption, the use of calcium hydroxide also has two other important goals: to control bleeding, and to necrotize residual pulp tissue and to make the necrotic tissue more soluble to sodium hypochlorite. Because of the limited access by instruments to all areas of the resorption cavity, chemical means are needed to completely clean the canal. Studies on the effectiveness of sodium hypochlorite and calcium hydroxide to remove the resorptive and other tissues from the root canal indicate that they have an additive or even synergistic effect [15]. In cases where the resorption has not perforated, it is usually enough to use calcium hydroxide paste in the canal once from 1 to 2 weeks. This allows removal of the residual tissue at the next appointment by irrigation and instrumentation.

In our treatment protocol, we choose Gutta flow Bioseal (COLTENE) sealer due to its versatile property of Bioceramic component & gutta-percha particles. Upon contact with fluids, this material provides natural repair constituents, such as silicates and calcium, which contribute to the activation of biochemical processes, providing additional support to the root canal regeneration. Anovel material for root canal filling that combines gutta-percha in a powder form with a particle size of less than 30 μm and a sealer .The sealer has also showed least cytotoxicity as well as inflammatory reaction. [16]

IV. Conclusion

It is puzzling in diagnosing and treating a root resorption case, therefore a suitable management is

perilous. Thorough investigations and discussion are required for the management especially when the prognosis of the tooth is poor upon consultation. Absence of periapical lesion and no signs and symptoms at the 12-months review provided a favorable outcome to once a tooth of hopeless prognosis.

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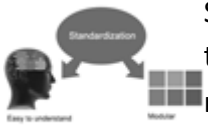

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Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Medical Research Paper

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of medical research then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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