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Radiology, Diagnostic Imaging and Instrumentation



Highlights

- An Unusual Cause of Stridor
- Denoising and Analysis of EMG
- Influence on Spectral Density
- Observational and Comparative

Discovering Thoughts, Inventing Future

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Effect of RF Fields During Pulse on Rotational Diffusion: Influence on Spectral Density

By Dennis J Sorce

Abstract- The effect of the applied RF field in an NMR experiment on the magnitude of the Spectral Density for a Dipolar Relaxation Mechanism is demonstrated theoretically. The effect was shown with Sin Cos Pulse as a concrete example. The order of magnitude of the magnetic moment where these effects will be significant for typical Rf amplitude values was derived. The effect may be of utility in providing an alternate method of control for MRI Tissue Contrast applications with further development.

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I. Introduction

In contemporary NMR methodologies, it is common to find experimental scenarios where the relaxation of the magnetization during a pulse train is important to be able to model and quantify. (1,2,3) In this note, we suggest that for some molecular species the Rotational Diffusion can be affected and modified by the Magnetic Field Torque of the applied radio- frequency pulse. During the course of working on this concept, it has come to our attention that the Russian investigator Sitnitsky (4) has investigated this phenomenon.

This proposed influence may be used in some models for explaining experimental data, such as for Liquid Crystals (14). We demonstrate the derivation of this effect on the spectral densities following the classic treatment of Abragam (5) and gives some ranges of where this effect may be of importance.

We note that the proposed effects may be useful as another avenue to control the spin- dynamics of an experimental system while the pulse is on. Also, the proposed effects have been dealt with rigorously in the Physics Literature (15).

II. Theory

The "Toy Model" we propose to explicate this effect is the following.

We envision a spin system, transformed to the Tilted Doubly Rotating Frame (TDRF,6). In this frame there will be defined a so-called "effective field." We can write down an effective Hamiltonian for the applied RF of the following form:

$$H^{RF}[t] = I_x \omega_1[t] + I_z \Delta\omega[t] \qquad [1]$$

For the exposition here we consider the Sin/Cos pulse, defined as:

$$\omega_1[t] = \omega_1^M \, \mathrm{Sin}[\omega_1^M t] \qquad [2a]$$

$$\Delta\omega[t] = \omega_1^M \, \mathrm{Cos}[\omega_1^M t] \qquad [2b]$$

Where ω_1^M is a constant (See for example the relevant papers of the Garwood Group (7,8,9).

In the TDRF the effective field can be seen from geometric arguments to be defined as:

$$\omega_{eff}[t] = \sqrt{\omega_1[t]^2 + \Delta\omega[t]^2} \qquad [3]$$

Substituting Eq [2 a, b] into Eq [3], one easily appreciates that $\omega_{eff}[t] = \omega_1^M$. So that as required for our treatment the effective field defined as:

$$B_{eff}[t] = \frac{\omega_1^M}{\gamma_{particle}} \qquad [4]$$

Where $\gamma_{particle}$ is the particle gyromagnetic-ratio.

Now we consider a Molecular Species in solution with a defined dipole moment $\mu^{particle}$.

In a constant field B_{eff}, there is a potential energy of interaction (10) between the moment and the field defined as:

$$U[\theta] = -\mu^{particle} B_{eff} \mathrm{Cos}[\theta] \qquad [5]$$

Here the angle θ is defined as the angle between the vectorial directions of the dipole moment and the constant field.

We change to the convenient notation:

$$K_0 = \mu^{particle} B_{eff} \qquad [6a]$$

So that:

$$U[\vartheta] = -K_0 \mathrm{Cos}[\vartheta] \qquad [6b]$$

Knowing the geometry between the effective field and the magnetic moment in the TDRF, it is Seen that the angle ϑ is defined as:

$$\vartheta[t] = Arc\,\mathrm{Tan}[\frac{\omega_1[t]}{\Delta\omega[t]}] \qquad [7]$$

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Using Eq[2a,b] in Eq[7]we see that:

$$\vartheta[t] = \omega_1^M t \qquad [8]$$

Suppose we take the Nuclear Species of Interest to be in a molecule that we model and approximate as a sphere. We assume that the Rotational Brownian Motion can be represented as a series of small incremental rotations. We seek to find the Correlation Function, which characterizes the rotational diffusion. As treated, in for example Abragam Chapter VIII or other places in the literature (11,12) we can define the Correlation Function in terms of the spatial part of the Dipolar Interaction Hamiltonian. If we adopt the notation of Abragam, we can define the Correlation Function as:

$$G[t, K_u, m_p] = \iint_{\Gamma_\vartheta \Gamma_{\vartheta_p}} F^*[\theta, 0, m_p] F[\theta_p, 0, m_p] W[\theta, \theta_p, Ku, t] \mathrm{Sin}[\theta] d\theta \, \mathrm{Sin}[\theta_p] d\theta_p \qquad [9]$$

Where we set and consider the case where m_p is zero.

So, to carry out this program we need to an expression for the Probability Density Function.

This PDF will be a solution of the so-called Smoluchowski Equation (SE), where the effects of the applied RF Torque will be included. As one can infer there are numerous assumptions one can apply to the formulation of the SE. The solution in general, (see for example, the classic papers of Coffey's group (10) are not trivial, usually the derivation of series solutions which involve the solution of iterative expressions for the expansion coefficients, or continued fraction solutions.

We have chosen to present and use the solution of Sitnitsky (4) which is the most easily implemented solution we have found to program for demonstration of our methods.

Please see Appendix I for a detailed definition of the terms in the series expression for the PDF.

The PDF can be taken to be the approximate solution of the following partial differential Equation using our expression for the Potential Energy Term. (4)

$$\tau_R \frac{\partial w[x, x_i, K_u, t]}{\partial t} = \frac{\partial^2 w[x, x_i, K_u, t]}{\partial^2 x} - (2K_u + \tau_R C[x]) \frac{\partial w[x, x_i, K_u, t]}{\partial x} + w[x, x_i, K_u, t](K_u{}^2 + \tau_R C[x] K_u) \qquad [10a]$$

$$C[x] = \frac{b}{\mathrm{Cos}[k_1 x]} \int_{-1}^{1} d\,' \mathrm{Cos}[k_1 x'](x - x') Exp[-\lambda \mid x - x' \mid] \qquad [10b]$$

Here b is a constant defined in (4).

In Eq [10] x is defined to be as $\mathrm{Cos}[\theta]$ where K_u measure as defined previously the interaction between the Moment and the RF field with the definition:

$$K_u = \frac{K_0}{k_B T} \qquad [11]$$

We can use the definition of the PDF to calculate the Correlation Function as In Eq [9] and then compute the corresponding Spectral Density as:

$$J[\omega, K_u, t, m_p] = \int_0^t G[t_p, K_u, m_p] Exp[i\omega t_p] dt_p \qquad [12]$$

In Figure 1 we show the dependence of the Spectral Density as given in Eq [12], for the case mp=0.

As can be seen, there is found to be an appreciable dependence of the Spectral Density on the parameter K_u this is taken to indicate that the RF Field, with a range of values which will be discussed below, can affect the Spectral Density which is used to compute relaxation functions. (5,11,12) So that the RF field, through interaction on the Rotational Brownian Motion, can influence the values of the calculated relaxation functions during a pulse sequence.

To the knowledge of the author, this possibility has not been fully appreciated in the NMR literature.

III. Discussion

The reader may wonder what is a lower bound on the magnetic moment of the particle of Interest for a typical value of the pulse amplitude.

In the Garwood papers (7,8,9), the pulse amplitude is typically on the order of 3.610^3 Hz. Then we reason that the interaction energy of the magnetic moment with the field in the TDRF should be greater than the thermal energy of the surrounding liquid medium.

So, we propose:

$$K_u >> 1$$

$$u^{particle} B_{eff} >> k_B T$$

Or

$$u^{particle} >> \frac{k_B T}{B_{eff}}$$

We note that the units of a magnetic moment can be seen in CGS units to be $\frac{ergs}{Gauss}$.

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So, at room temperature in CGS units, $k_B T$ is on the order of $10^{-14} ergs$ B_{eff} , is typically on the order of 10^{-4} Gauss.

$$u^{particle} >> 10^{-10} \frac{ergs}{Gauss}$$

Practical lower bound on the magnetic moment of the particle for an effect of the RF field on the Rotational Brownian Motion of the particle and consequently on the Spectral Density for a dipolar relaxation mechanism.

Appendix I

The following is the series definition of the Probability Density Function used in the text. (see,4)

$$A_n = \frac{2\,\mathrm{Cos}[\frac{\theta_i}{2}]\mathrm{Sin}[q_n\,\mathrm{Cos}[\theta_i]]}{[1-\frac{1}{2q_n}\mathrm{Sin}[2q_n]]}$$

$$B_n = \frac{2\,\mathrm{Cos}[\frac{\theta_i}{2}]\mathrm{Cos}[k_n\,\mathrm{Cos}[\theta_i]]}{[1+\frac{1}{2k_n}\mathrm{Sin}[2k_n]]}$$

With

$$\lambda >> 1$$

$$\mathrm{Tan}[q_n] = -\frac{q_n}{\lambda}$$

$$Cot[k_n] = \frac{k_n}{\lambda}$$

$$n = 1, 2, 3, ...$$

$$\nu_n = 2\lambda b \frac{[k_n^2 - k_1^2]}{[k_1^2 + \lambda^2][k_n^2 + \lambda^2]}$$

$$\sigma_n = 2\lambda b \frac{[q_n^2 - k_1^2]}{[k_1^2 + \lambda^2][k_n^2 + \lambda^2]}$$

$$w[\theta, \theta_i, K_u, t] = \frac{w_{eq}[\theta, K_u]}{\mathrm{Cos}[k_1\,\mathrm{Cos}[\theta]}[\frac{1}{B_1}\sum_{n=1}^{\infty} B_n Exp[-\nu_n t]\mathrm{Cos}[k_n\,\mathrm{Cos}[\theta]] +$$

$$(\frac{\mathrm{Cos}[k_1\,\mathrm{Cos}[\theta_i]]}{\mathrm{Cos}[\frac{\theta_i}{2}]w_{eq}[\theta, K_u]} - \frac{1}{B_1})\sum_{n=1}^{\infty} A_n Exp[-\sigma_n t]\mathrm{Sin}[q_n\,\mathrm{Cos}[\theta]]]$$

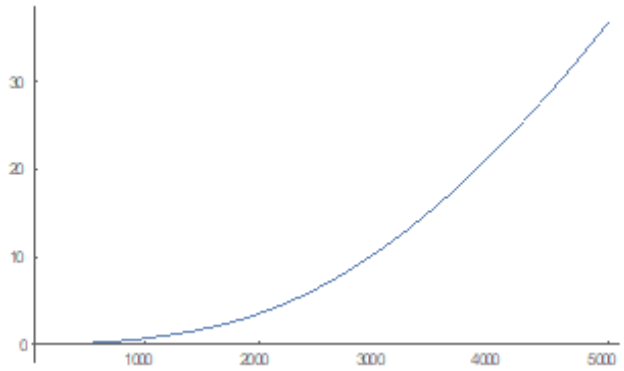


Figure 1: Dependence of Spectral Density on the Ku parameter. (See text for Definition of Ku.)

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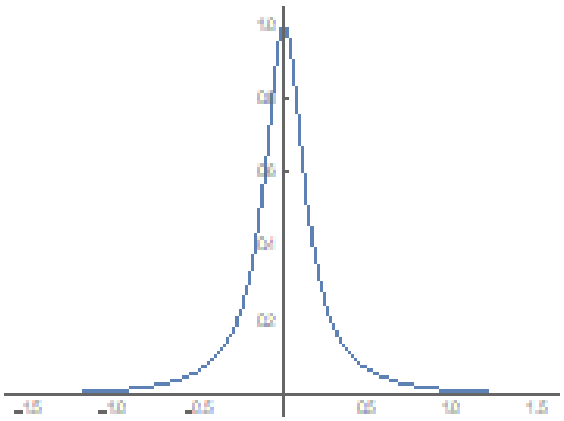


Figure 2: Plot of Probability Density Function Theta

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Observational and Comparative Study of Utility of Transabdominal Ultrasound in Diagnosis of Mild Acute Gastritis

By Dr. Vikas Leelavati Balasaheb Jadhav, Dr. S. G. Gandage, Dr. Sanjay M. Khaladkar & Dr. Rajesh S. Kuber

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Abstract- Background: Inflammation of the gastric mucosa is gastritis. It may be acute or chronic. It usually affects half of the world population. Acute gastritis is caused by medications, like, NSAID (Nonsteroidal Anti-Inflammatory Drugs) and Corticosteroids, viral infection, extreme stress, etc.

Aim and Objectives: To assess/evaluate the role of transabdominal ultrasound as an imaging modality for the diagnosis of acute gastritis and to study patterns of involvement of various layers of the stomach wall.

Materials and Methods: The thickness of the whole Stomach wall and individual layers were calculated in 20 normal individuals (Control) and 20 Patients of Gastritis, confirmed later on Endoscopy. Endoscopy was performed on the same or the next day after the Sonography.

Keywords: acute gastritis, gastric erosion, mucosal erosions, mucosal thickness, layers, gut signature, sonography, ultrasound, gastric wall, stomach.

GJMR-D Classification: NLMC Code: WN 180



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Observational and Comparative Study of Utility of Transabdominal Ultrasound in Diagnosis of Mild Acute Gastritis

Dr. Vikas Leelavati Balasaheb Jadhav [α], Dr. S. G. Gandage [σ], Dr. Sanjay M. Khaladkar [ρ] & Dr. Rajesh S. Kuber [ω]

Abstract- ***Background:*** Inflammation of the gastric mucosa is gastritis. It may be acute or chronic. It usually affects half of the world population. Acute gastritis is caused by medications, like, NSAID (Nonsteroidal Anti-Inflammatory Drugs) and Corticosteroids, viral infection, extreme stress, etc.

Aim and Objectives: To assess/evaluate the role of transabdominal ultrasound as an imaging modality for the diagnosis of acute gastritis and to study patterns of involvement of various layers of the stomach wall.

Materials and Methods: The thickness of the whole Stomach wall and individual layers were calculated in 20 normal individuals (Control) and 20 Patients of Gastritis, confirmed later on Endoscopy. Endoscopy was performed on the same or the next day after the Sonography.

Results: There was thickening of layer 2 (muscularis mucosa) in the Mild acute gastritis. Thickening of Layers 1 and 2 and total gastric wall thickness was statistically significant. The ratio of the thickness of Layer 2 to a total Gastric wall thickness was statistically significant. These observations indicate that transabdominal Ultrasound with convex probe, followed by linear probe can predict gastritis and can reduce the number of endoscopic evaluations and further ulcer formations. It can also predict associated mucosal erosions if layer 1 thickness is less than 1 mm with associated thickening of layer 2.

Keywords: acute gastritis, gastric erosion, mucosal erosions, mucosal thickness, layers, gut signature, sonography, ultrasound, gastric wall, stomach.

I. Introduction

Inflammation of the gastric mucosa is gastritis. Depending on the duration, it can be acute or chronic. It usually presents with nausea, vomiting, bloating, loss of appetite, burning pain in the epigastric region and unexplained weight loss. It usually affects half of the world population. Acute gastritis is caused by medications, like NSAID (Nonsteroidal Anti-Inflammatory Drugs) and corticosteroids, bacterial infections (H. Pylori), excessive alcohol consumption, viral infection, extreme stress, systemic stress, bile reflux, surgery, ingestion of corrosive substances, kidney failure, ICU Patients on Ventilator, autoimmune diseases affecting the stomach mucosa (autoimmune gastritis), Crohn's Disease, spicy foods, radiation, vasculitis, etc.[1]

Histologically, it is characterized by infiltration of the mucosa of gastric body and antrum with granulocytes. Pangastritis refers to inflammation of the entire stomach. German Physician George Ernst Stahn in 1728, first coined the term Gastritis. Charles and Handfield Jones and Wilson Fox, in 1854, first described microscopic changes of stomach mucosa in diffuse and segmental forms of gastritis. British physician William Brinton in 1859, first described acute, subacute and chronic gastritis. Italian Anatomical pathologist Giovanni Battista Morgagni first described characteristics of gastric inflammation – erosive gastritis and ulcerative gastritis.[2]

II. Material and Method

a) Aim and Objective

This study aimed to determine the signs of Mild Acute Gastritis on TransAbdominal Ultrasound.

b) Material and Method

Sonographic evaluation of the stomach was performed by an experienced Sonologist using a convex (3-5 MHz) probe, followed by a linear transducer (7-12 MHz) after obtaining Oral Informed Consent. (Figures 1, 2)

The patient was administered water for gastric distension (between 200 to 1000 ml depending upon capacity and without causing nausea), stomach wall was evaluated in the body and antrum, after adequate gastric distension.

The patient was initially examined in the supine position, followed by the right lateral decubitus position.

The Transducer was kept in the Epigastric region, initially in the Transverse plane and fluid filled stomach was identified. Then the Probe was placed in the sagittal plane and the stomach body and antrum

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were evaluated by shifting the transducer from left to right.

The multilayered wall of the stomach was best seen in the parasagittal plane, just on the right side of the midline, using the left hepatic Lobe as an acoustic window. (Figures 3, 4).

Fluid-filled stomach was seen between left hepatic lobe and caudate lobe anteriorly and pancreas posteriorly.

Whole Stomach wall thickness and thickness of individual layers (S1-S5), was measured in the cross-section, in the longitudinal section at the level of superior mesenteric Artery.

The thickness of the whole stomach wall and individual layers were calculated in 20 normal individuals (control) and 20 patients of gastritis, confirmed later on endoscopy. Endoscopy was performed on the same or the next day after the Sonography. The results of the direct mucosal inspection on Endoscopy were documented and Biopsy was obtained from the involved area.

Pathologist examined the presence of Gastritis. On histopathology, none of the patients had other illnesses than gastritis. Pathologic findings were used as a gold standard to evaluate the ultrasound findings.

III. Study Design

The thickness of the whole Stomach wall and individual layers were calculated in 20 Normal individuals (Control) and 20 Patients of Gastritis, confirmed later on Endoscopy.

Exclusion criteria were–Simple Obesity (Body Mass Index more than or equal to 25 kg/m2), previous history of gastric surgeries, abdominal surgeries, abdominal radiotherapy, suspected cases of Acute Pancreatitis, Acute Cholecystitis, and Abdominal Malignancy.

Fasting guidelines (Strict nil by mouth 8 hours before sonography) were applied.

Demographic Age, Sex, BMI, Smoking, Alcohol consumption and ingestion of NSAID were recorded.

Our research included both the Pediatric and Adult populations.

The thickness of gastric layers on ultrasound are labeled as (Figures 3,4)

S1-Mucosa.
S2-Muscularis mucosa
S3-Submucosa
S4-Muscularis propria
S5–Serosa
&
Whole wall thickness in the gastric antrum.

The thickness of individual layers- Layer 1, Layer 2, Layer 3, Layer 4, Layer 5, total The thickness of Gastric wall (including layers 1 to 5), were obtained in 20 Controls (normal) and 20 patients of gastritis. The ratio of Layer 2 to the full the thickness of the gastric wall was obtained in Controls and Patients of Gastritis.

IV. Results

Table 1: Control Group

Sr. No	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 1+2	Total wall thickness	Layer 2/Total Wall thickness
1	1	1	2	2	1	2	7	0.142857143
2	1	1.1	2	2	1	2.1	7.1	0.154929577
3	1	1	2.1	2	1	2	7.1	0.14084507
4	1	0.9	2.1	2	1	1.9	7	0.128571429
5	1	1	2	2	1	2	7	0.142857143
6	1	1.1	2.2	2	1	2.1	7.3	0.150684932
7	1	1.1	2.3	2	1	2.1	7.4	0.148648649
8	1	1	2.1	2	1	1.9	7.2	0.138888889
9	1	0.9	2	2	1	1.9	6.9	0.130434783
10	1	1	2.1	2	1	2	7.1	0.14084507
11	1	1.1	2.2	2	1	2.1	7.3	0.150684932
12	1	1	2	2	1	2	7	0.142857143
13	1	1	2	2	1	2	7	0.142857143
14	1	0.9	2.1	2	1	1.9	7	0.128571429
15	1	1	2.1	2	1	2	7.1	0.14084507
16	1	1	2.4	2	1	2	7.4	0.135135135

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18	1	1	2.3	2	1	2	7.3	0.136986301
19	1	1.1	2	2	1	2.1	7.1	0.154929577
20	1	1	2	2	1	2	7	0.142857143

Table 2: Study Patient Group

Sr. No	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 1+2	Layer All Total wall thickness	Layer 2+3	Layer 2/Total Wall thickness
1	1	2	2	2	1	3	8	4	0.25
2	1	3	2.1	2	1	4	9.1	5	0.32967033
3	<1	2	2	2	1	3	8	4	0.25
4	1	2	2.2	2	1	3	8.2	4	0.243902439
5	<1	3	2	2	1	4	9	5	0.333333333
6	1	3	2	2	1	4	9	5	0.333333333
7	1	2	2.2	2	1	3	8.2	4	0.243902439
8	1	2	2	2	1	3	8	4	0.25
9	<1	3	2.3	2	1	4	9.3	5	0.322580645
10	1	2	2	2	1	3	8	4	0.25
11	1	2	2	2	1	3	8	4	0.25
12	1	3	2.1	2	1	4	9.1	5	0.32967033
13	1	2	2	2	1	3	8	4	0.25
14	<1	3	2	2	1	4	9	5	0.333333333
15	1	2	2.1	2	1	3	8.1	4	0.24691358
16	1	3	2	2	1	4	9	5	0.333333333
17	<1	3	2	2	1	4	9	5	0.333333333
18	1	3	2	2	1	4	9	5	0.333333333
19	1	3	2.2	2	1	4	9.2	5	0.326086957
20	1	2	2	2	1	3	8	4	0.25

Chi Square= 0.04228 ; p-value= >0.9999999

In Control group (Figures 3, 4)

- The thickness of Layer 1 was 1 mm,
- The thickness of Layer 2 was 0.9 to 1.1 mm
- The thickness of Layer 3 was 2 mm to 2.4 mm
- The thickness of Layer 4 was 2 mm
- The thickness of Layer 5 was 1 mm
- The Combined thickness of Layer 1 and 2 was 1.9 to 2.1 mm.
- Total thickness of the Gastric wall (Layer 1-5) was 6.9 mm to 7.4 mm.
- Ratio of the thickness of Layer 2 to total wall thickness was 0.12 to 0.15

In Acute Mild Gastritis group- (Figures 5, 6)

- The thickness of Layer 1 was 1 mm,
- In 5 cases of Gastric erosion (Proved on Endoscopy) The thickness of Layer 1 was less than 1 mm
- The thickness of layer 2 was 2 to 3 mm
- The thickness of layer 3 was 2 mm to 2.3 mm
- The thickness of layer 4 was 2 mm
- The thickness of layer 5 was 1 mm
- The combined thickness of layer 1 and 2 was 3-4 mm.
- Total thickness of the Gastric wall (layer 1-5) was 8 mm to 9.2 mm.
- Ratio of the thickness of Layer 2 to the total gastric wall thickness was 0.25 to 0.33

Thus, in Patients of Mild Gastritis, there was thickening of layer 2.

Thickening of Layers 1 and 2 and total gastric wall thickness was statistically significant. Ratio of the thickness of Layer 2 to a total Gastric wall thickness was statistically significant.

Ultrasound findings of gastritis were confirmed on gastroscop y examination (Figure7).

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Figure 1: Ultrasound scanning with Convex Probe showing the position of the Convex probe in the epigastric region, in transverse (A) and in longitudinal (B) plane

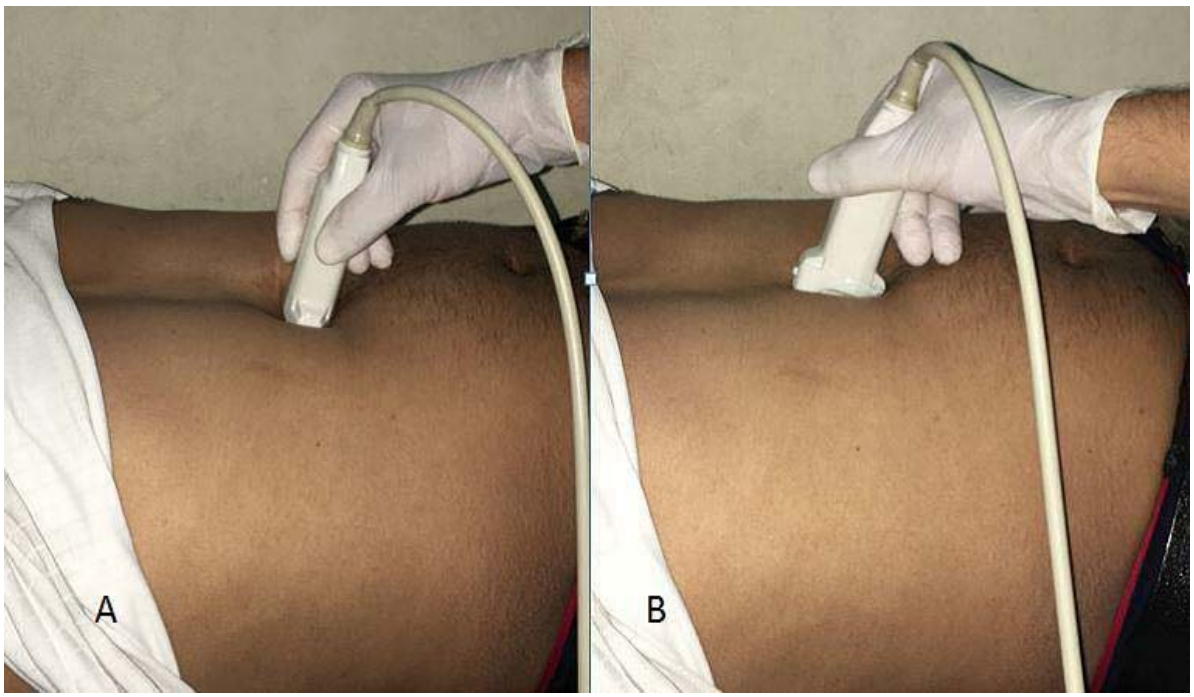


Figure 2: Ultrasound scanning with Linear Probe showing the position of the Linear probe in the epigastric region, in transverse (A) and in longitudinal (B) plane

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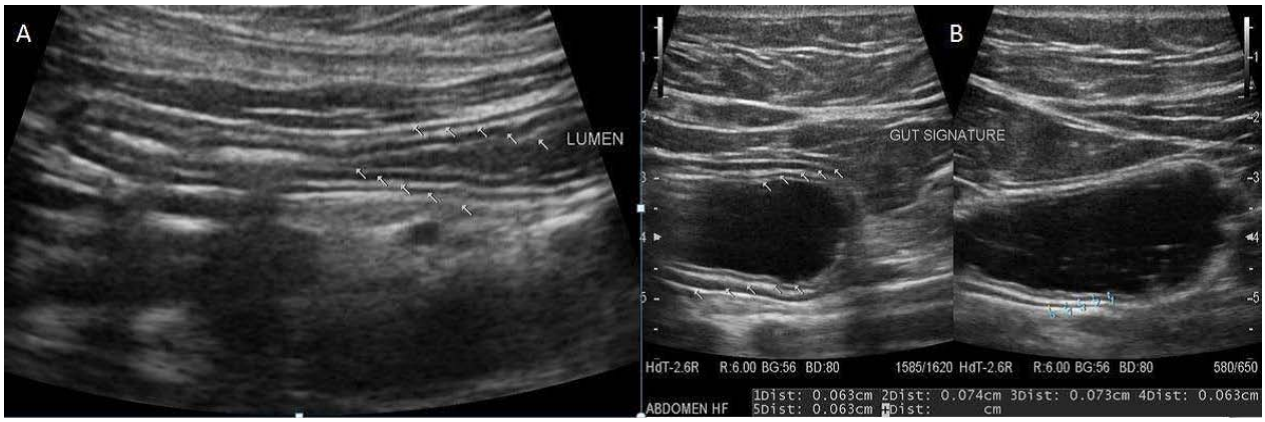


Figure 3: Ultrasound with the Convex Probe showing Layers of Stomach wall

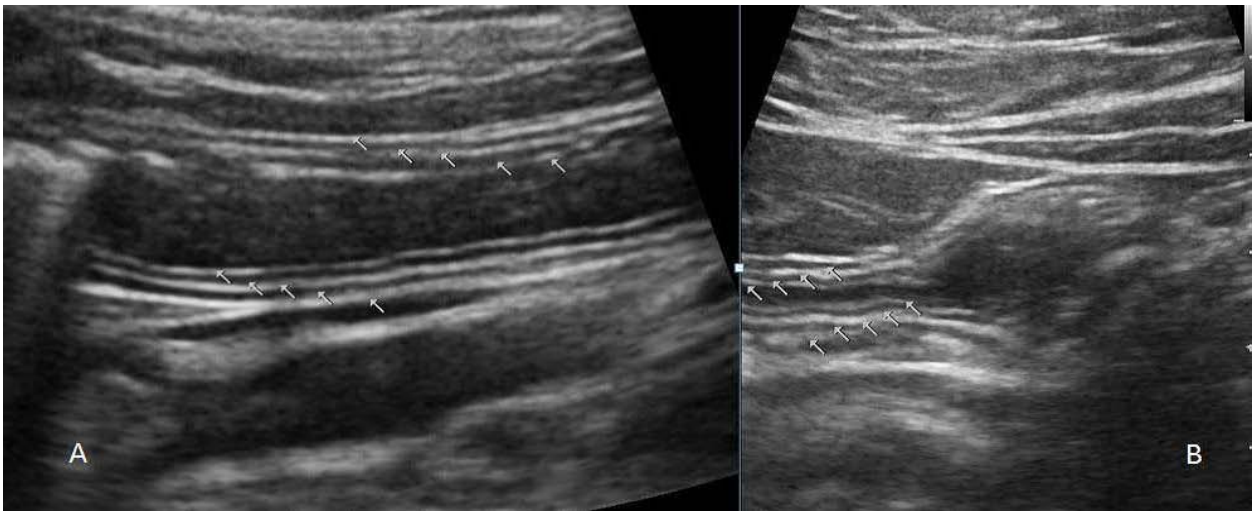


Figure 4: Ultrasound with the Linear Probe showing Layers of Stomach wall

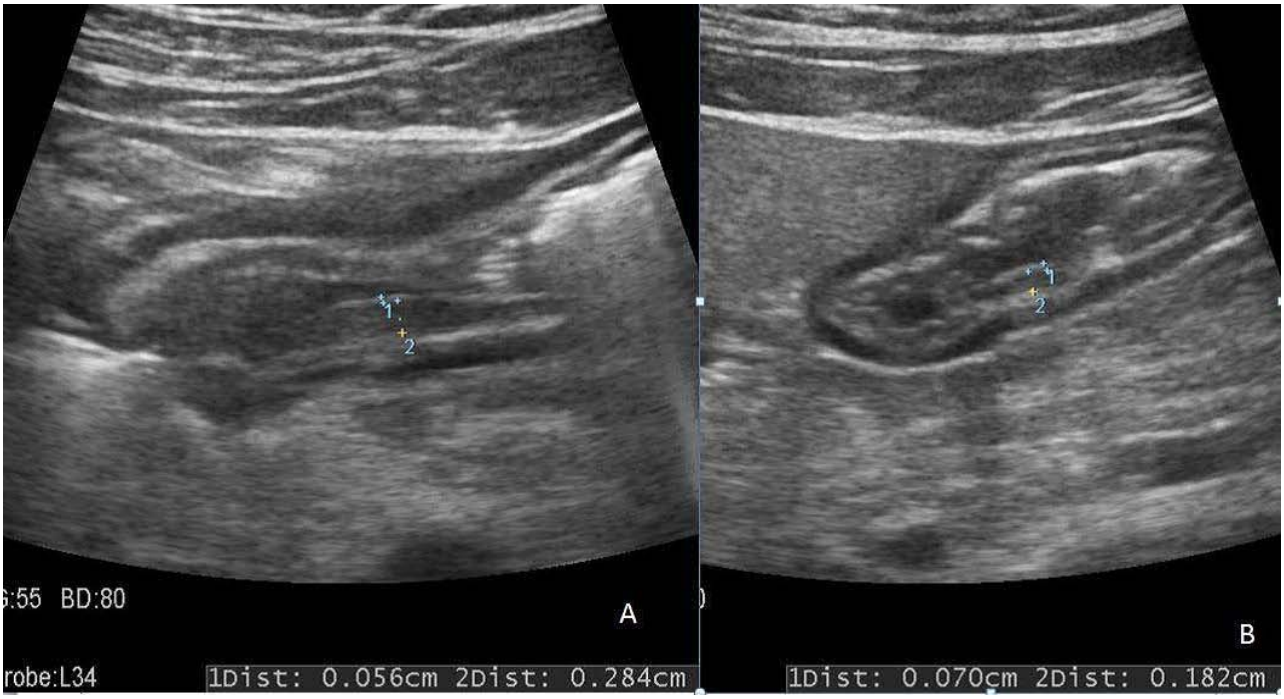


Figure 5: Ultrasound with the Convex Probe showing thickening of Layer 2 of Stomach in Mild Acute Gastritis

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Figure 6: Ultrasound with Linear Probe showing thickening of Layer 2 of Stomach in Mild Acute Gastritis

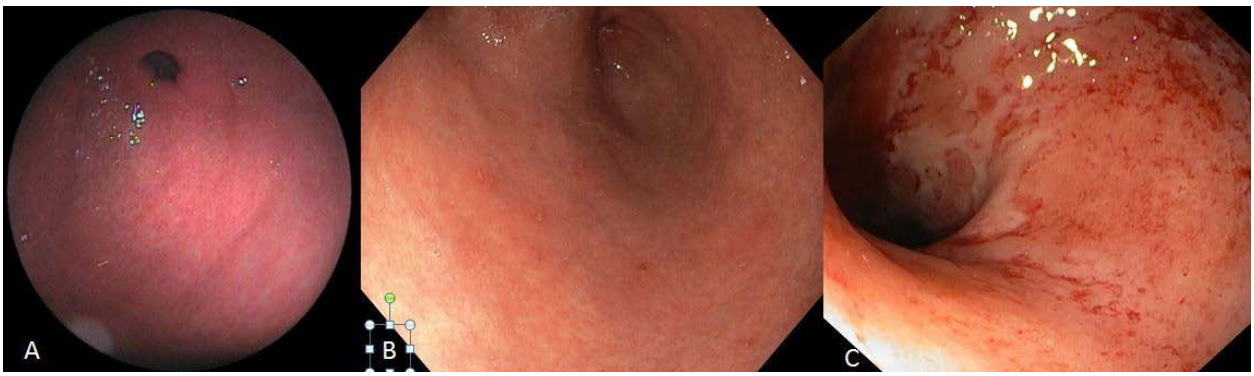


Figure 7: Gastros copy images showing Normal mucosa (A), Mucosa in Mild Acute Gastritis (B) and Mucosa in Erosive Gastritis (C)

V. Discussion

Histologically Stomach has four layers, Mucosa, Submucosa, Muscularis Externa and Serosa. Mucosa has three components–Surface epithelium, lamina propria and muscularis mucosa.

Muscularis Propria or Externa has an oblique layer, circular layers and longitudinal layers.[3]

On ultrasound, Gastric wall delineates five distinct layers from within outwards.

From the luminal side- First inner hyper echoic layer, Second inner hypoechoic layer, Third middle hyper echoic layer, Fourth outer hypo echoic layer and Fifth outermost hyperechoic layer.

From lumen to serosa,

1) The first Echogenic layer represents the interphase between luminal content and the mucosa.
2) The second Hypoechoic layer is due to muscularis mucosa.
3) The third hyperechoic layer is due to Submucosa, which contains Fat and Connective tissue,
4) The fourth Hypoechoic layer is due to muscularis propria or externa, which is composed of muscles.
5) The fifth Hyperechoic layer is due to serosa.

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The first and fifth layers represent interphases.

Individual layer thickness-

Normal thickness of various gastric layers were as follows-

The total wall thickness of 6-7 mm
S1–Hyperechoic layer, Mucosa–1 mm.
S2-Hypoechoic layer, Muscularis mucosa–1 mm.
S3-Hyperechoic layer, Submucosa–2-2.5 mm.
S4-Hypoechoic layer, Muscularis propria, 2 mm.
S5–Hyperechoic layer, Serosa, 1 mm.[3]

Layer 1 and 2 represent Mucosa.

Erosion is restricted to the Mucosa, hence layers one and two are involved.

In Ulcer, sub mucosa has to be involved, hence layer 3 is disrupted.

A penetrating Ulcer may extend up to Serosa, in cases of impending perforations. Hence all five layers are involved.[3]

Gastritis can be acute and chronic. Acute gastritis can be mild and severe. In mild Acute Gastritis, the surface epithelium is intact. The mucosa is hyperaemic, oedematous, congested and red. Histologically, there are intraepithelial and intraluminal neutrophils. In severe acute gastritis, there are mucosal erosions with resultant loss of surface epithelium, hemorrhages seen as punctate dark spots with inflammatory and fibrinous purulent exudates. Acute erosive hemorrhagic gastritis is characterized by concurrent erosion and hemorrhages with extensive mucosal damage and is commonly seen in alcoholic and NSAID users.[4,5]

Acute gastritis is caused by H. Pylori, other infectious causes (like bacteria, viruses, fungi and parasites), and non-infective gastritis. Chronic gastritis can be Type A (AutoImmune-Body-fundic predominant), Type B (H. Pylori related–Antral predominant), Type AB (Environmental-Antral-body predominant), Chemical (Reflux-Antral-body predominant) and uncommon forms of gastritis.[6-8]

In Patients of Mild Acute Gastritis, there is a thickening of layer 2 and total gastric wall thickness, on ultrasound. The ratio of the thickness of Layer 2 to total Gastric wall thickness is significant.[9]

Our observations indicate that transabdominal Ultrasound with Convex Probe, followed by Linear Probe, can predict diagnosis of Mild Gastritis and can reduce the number of Endoscopic Evaluations and further Ulcer formations. It can predict associated mucosal erosions if Layer 1 thickness is less than 1 mm with associated thickening of layer 2. In our case series, 5 cases of gastric erosions were detected on Ultrasound and were confirmed on gastroscopy.

Though Gastroscopy is Gold standard, Ultrasound can be used as a screening modality in the detection of Mild Acute gastritis. It is extremely useful, especially in Paediatric Age group and in Bed ridden patients. It is extremely useful in those individuals who are reluctant to undergo gastroscopy. However, endoscopy, even though invasive, has specific advantages of detection of Reflux Oesophagitis, Hiatus Hernia and extent of erosions, the status of entire gastric mucosa and duodenal bulb and most important it can obtain mucosal Biopsies.[9]

VI. Limitations

Gastric wall thickness differs with age, weight, sex, height and smoking and drinking habits.

Reference values of whole Stomach wall thickness and thickness of individual layers vary with diet and ethnicities. The thickness of the gastric wall can be influenced by muscular contractions in the gastric body and antrum.[10]

Further study with larger patient populations and control studies is needed for accurate interpretation of Sonographic findings of gastritis.

The small number of control and patients is the main limitation of this study. Due to this restriction, interpretation should be done with caution. However, our study increases awareness of Ultrasound clues and the diagnosis of gastritis.

VII. Conclusion

Our Results suggest that Trans Abdominal Ultrasound with the Convex Probe followed by a Linear Probe, is an excellent Noninvasive Modality in the detection of various layers of Gastric wall, detection of thickening of individual layers in Acute Gastritis. Thus, it is useful in the Diagnosis of Mild Acute Gastritis, thereby probably avoiding invasive procedures, like Gastroscopy and interventions like biopsies.

It can be used as a screening method in the detection of Acute Gastritis, as it is readily available, less time consuming, cheaper, non-invasive, can be done in all age groups (Paediatric to Elder), can be done as bedside procedures and free from Radiation and can be repeated multiple times.

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Denoising and Analysis of EMG Signal using Wavelet Transform

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Abstract- EMG is the recording of the electrical activity produced within the muscle fibers. Measurement of EMG signal is corrupted by additive noise whose signal-to-noise ratio (SNR) varies. Feature extraction is an important step for EMG classification. Time domain and frequency domain parameters were chosen as representative features for EMG signals. In this thesis, the Wavelet transform and wavelet coefficients have adopted to represent the EMG signals. Wavelet transform (WT) has been applied also in this research for the analysis of the surface electromyography signal (SEMG). The properties of wavelet transform turned out to be suitable for nonstationary EMG signals. Also Spectrum analysis has been applied to various types of EMG signal.

Keywords: EMG, wavelet transform, SNR, myopathy, neuropathy.

GJMR-D Classification: NLMC Code: WN 600

DENOISINGANDANALYSISOFEMGSIGNALUSINGWAVELETTRANSFORM

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Denoising and Analysis of EMG Signal using Wavelet Transform

Iffat Ara

Abstract- EMG is the recording of the electrical activity produced within the muscle fibers. Measurement of EMG signal is corrupted by additive noise whose signal-to-noise ratio (SNR) varies. Feature extraction is an important step for EMG classification. Time domain and frequency domain parameters were chosen as representative features for EMG signals. In this thesis, the Wavelet transform and wavelet coefficients have adopted to represent the EMG signals. Wavelet transform (WT) has been applied also in this research for the analysis of the surface electromyography signal (SEMG). The properties of wavelet transform turned out to be suitable for nonstationary EMG signals. Also Spectrum analysis has been applied to various types of EMG signal.

Keywords: EMG, wavelet transform, SNR, myopathy, neuropathy.

I. Introduction

EMG is the recording of the electrical activity produced within the muscle fibers. The nervous system controls the voluntary movement of various body parts in humans by contracting and relaxing various skeletal muscles. To instantiate a contraction, a neuron generates a small electrical potential on the surface of the muscle fiber. This electrical potential causes depolarization of the muscle fiber tissue and a following depolarization waveform. This waveform travels the length of the muscle fiber and is known as the Action Potential (AP) [1, 7].

To collect EMG signal, two techniques are applied, namely, Surface Electromyography (SEMG) and needle Electromyography. Although both mentioned techniques result in EMG signal, SEMG is more popular than needle EMG since SEMG is a non-invasive technique and more convenient to use [2].

The wavelet transform, a multi-resolution time-frequency analysis, is preferred for EMG analysis. The results of this work indicated using dubecies family as mother wavelet (MW) in 8 decomposition level to determine the muscle fatigue status. Wavelet analysis has been known as a flexible technique because a vast variety of the wavelet function exists in applying wavelet techniques. Power spectrum analysis on EMG signal was applied through different MWs in this study.

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II. Methods

To analyze EMG signal three domains of study have been utilized in many researches, time domain, frequency domain and time frequency domain. EMG is a non-stationary signal while it is assumed as a stationary signal in time domain. Also, working in the frequency domain has the problem of not having access to time domain. Consequently, wavelet analysis has been applied as a strong and more compatible technique with the nature of EMG signal since wavelet has proved much capability to analyze biomedical signals. These SEMG signals were decomposed using DWT with db6 wavelet functions. The DWT was implemented using MATLAB [3].

The wavelet transform is a convolution of the wavelet function ψ (t) with the signal x (t). Orthonormal dyadic discrete wavelets are associated with scaling function φ (t). The scaling function can be convolved with the signal to produce approximation coefficients S. The discrete wavelet transforms (DWT) can be written as:

$$T_{m,n} = \int_{-\infty}^{\infty} x(t)\psi_{m,n}(t)dt \dots\dots\dots\dots\dots \quad (1)$$

Where $T_{m,n}$ is known as the detail coefficient at scale and location indices (m, n).

The approximation coefficients of the signal at the scale m and location n can be represented by:

$$S_{m,n} = \int_{-\infty}^{\infty} x(t)\varphi_{m,n}(t)dt \dots\dots\dots\dots\dots \quad (2)$$

A discrete approximation of the signal can be shown as

$$x_0(t) = x_M(t) + \sum_{m=1}^{M} d_m(t) \dots\dots\dots\dots \quad (3)$$

Where the mean signal approximation at scale M is

$$x_M(t) = S_{M,n}\varphi_{M,n}(t) \dots\dots\dots\dots\dots\dots \quad (4)$$

The detail signal approximation corresponding to scale index m is defined for a finite length signal as

$$d_m(t) = \sum_{n=0}^{2^{M-m}-1} T_{m,n}\psi_{m,n}(t) \dots\dots\dots \quad (5)$$

The signal approximation at a specific scale was a combination of the approximation and detail at

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the next lower scale. If scale $m = 3$ was chosen, it can be shown that the signal approximation is given by

$$x_3(t) = x_0(t) - d_1(t) - d_2(t) - d_3(t) \ldots\ldots\ldots \quad (6)$$

Corresponding to the successive stripping of high frequency information (contained within the d_m (t)) from the original signal at each step [4]. This is referred to as multi-resolution analysis of a signal using wavelet transform, and is the basic of our procedure.

Figure 1: Shows the flow chart for the EMG feature extraction step

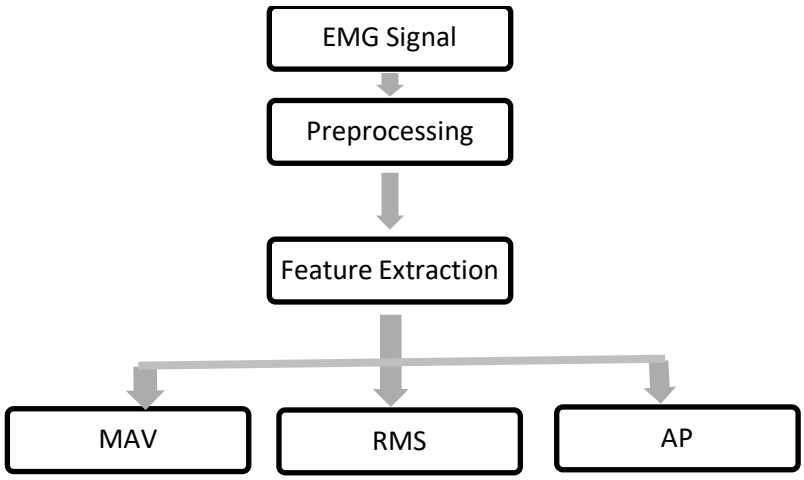


Figure 1: Flow chart of EMG features extraction algorithm

a) Prototypes of Wavelet

The large number of known wavelet families and functions provides a rich space in which to search for a wavelet which will very efficiently represent a signal of interest in a large variety of applications. Wavelet families include Biorthogonal, Coiflet, Haar, Symmlet, Daubechies wavelets [4], etc. There is no absolute way to choose a certain wavelet. The choice of the wavelet function depends on the application. The Haar wavelet algorithm has the advantage of being simple to compute and easy to understand. The Daubechies algorithm is conceptually more complex and has a slightly higher computational overhead. But, the Daubechies algorithm picks up detail that is missed by the Haar wavelet algorithm. Even if a signal is not well represented by one member of the Db family, it may still be efficiently represented by another. Selecting a wavelet function which closely matches the signal to be processed is of utmost importance in wavelet applications [5]. Daubechies wavelet families their energy spectrums are concentrated around low frequencies.

b) Denoising Of EMG Signal

The Surface EMG (SEMG) signals was denoised using discrete wavelet transform (DWT) and a threshold method. The DWT and threshold based denoising was implemented using MATLAB. Wavelets commonly used for denoising biomedical signals include the Daubechies (db2, db8, and db6) wavelets and orthogonal Meyer wavelet. The wavelets are generally chosen whose shapes are similar to those of the MUAP.

A process of removing the noise of a signal is called as de-noising. Once the signal is preprocessed then it can be used for further processing. In this study the identified high frequency components are D1, D2. These components must be filtered by applying a threshold. Then the threshold components are removed from the signal. The original EMG signals and the de-noised EMG signal of length 800 samples are shown in Figure 2.

III. Results

The raw SEMG data was downloaded from Physiobank database. Any of the WFs (db2, db4, db6, and db8) are effective for noise removal in the case of SEMG. In this experiment WF db6 is chosen and found to be effective for noise removal. As known, such signal is normally a function of time and is explained in terms of amplitude, frequency and phase. Thus, power spectrum generated from output signal was examined to identify appropriate signal parameters to distinguish signal from respective patients. From power spectrum point of view, both signals can be easily analyzed and classified in terms of amplitude, in terms of power spectral density. Many parameters can be calculated to use as rule base classifier input, which is mean absolute value (MAV), Average Power (AP), amplitude in terms of root mean square (RMS), minimum and maximum power spectral density.

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The wavelet analysis tool as well as the graphical result for different normal and abnormal EMG signal is presented. The wavelet analysis of EMG signal is performed using MATLAB software. MATLAB is a high performance; interactive system which allows to solve many technical computing problem. MATLAB 7.5 versions have been used to write computer program designed for analyzing.

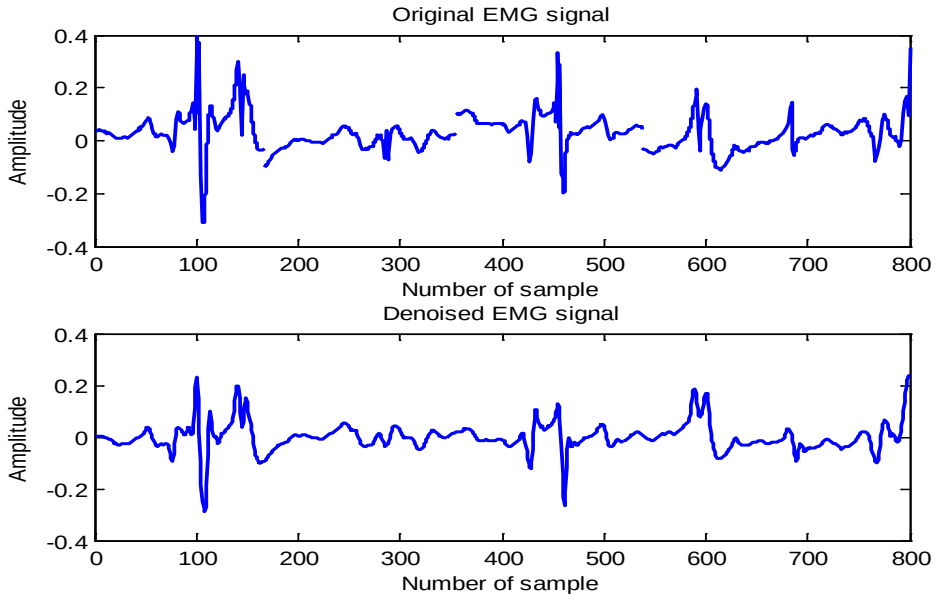


Figure 2: Original and De-noised Healthy EMG signal

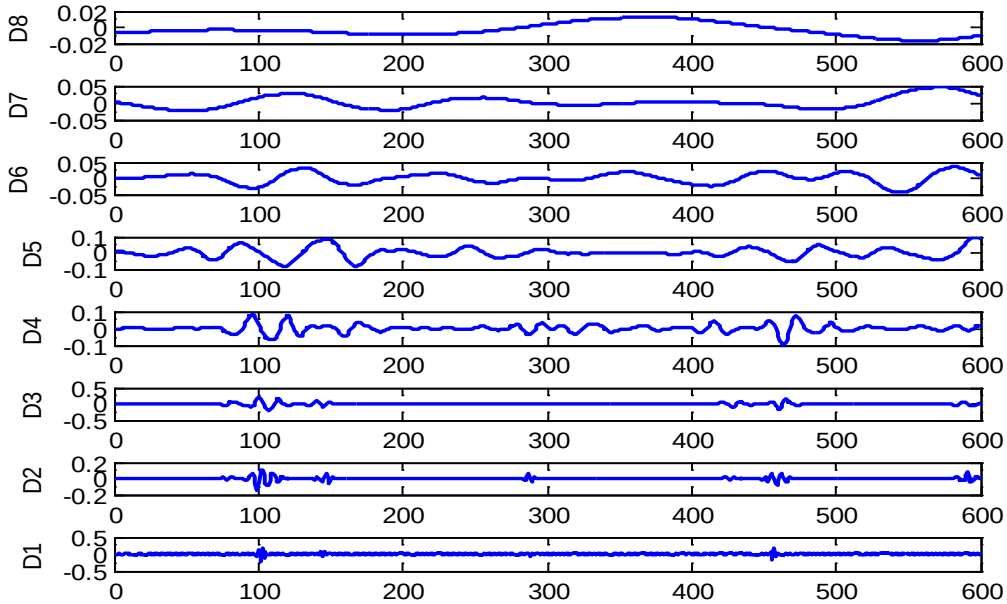


Figure 3: Representation of different level of wavelet detail coefficient

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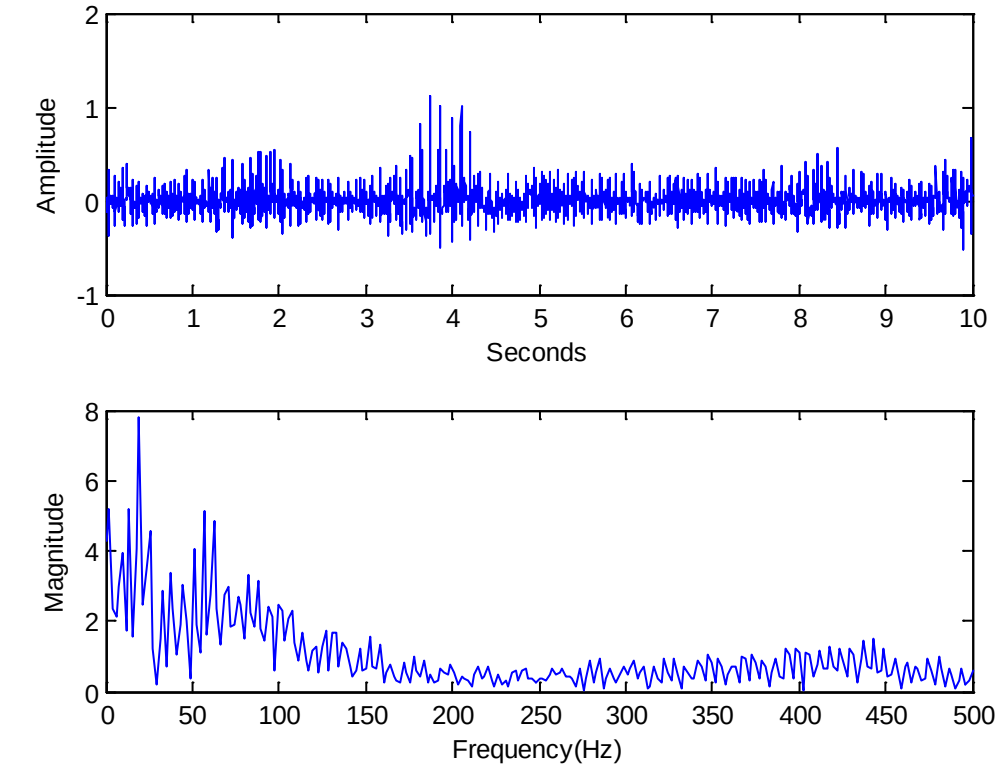


Figure 4: (a) Original healthy EMG signal and (b) Frequency domain representation of EMG

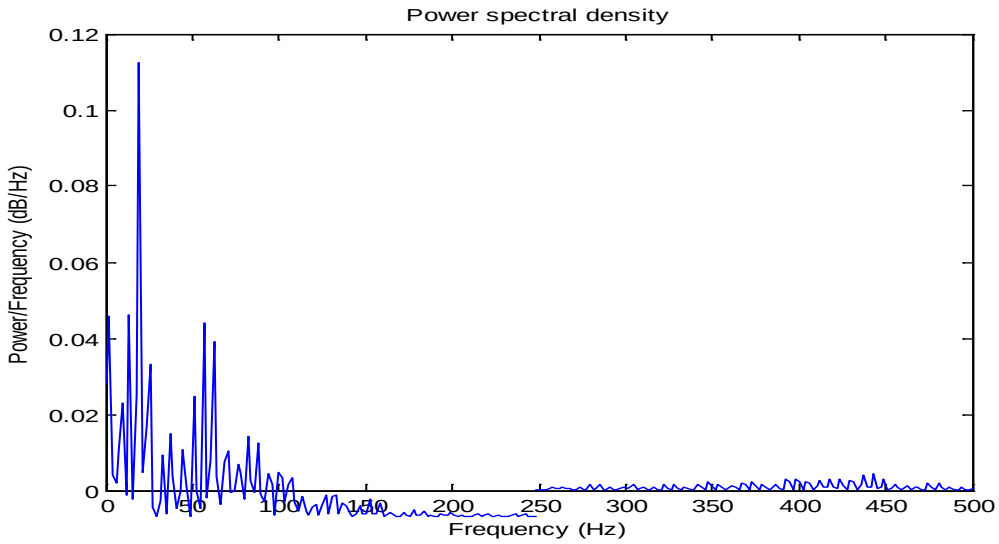


Figure 5: Power spectral density of Healthy EMG signal

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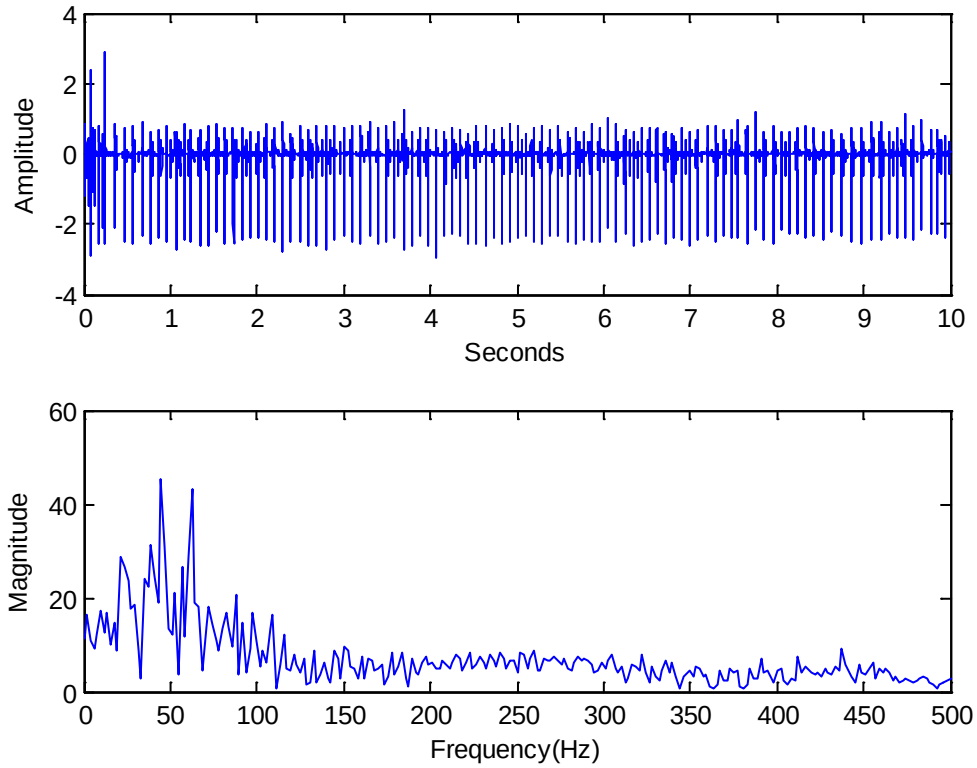


Figure 6: (a) Original Neuropathy EMG signal and (b) Frequency domain representation of EMG

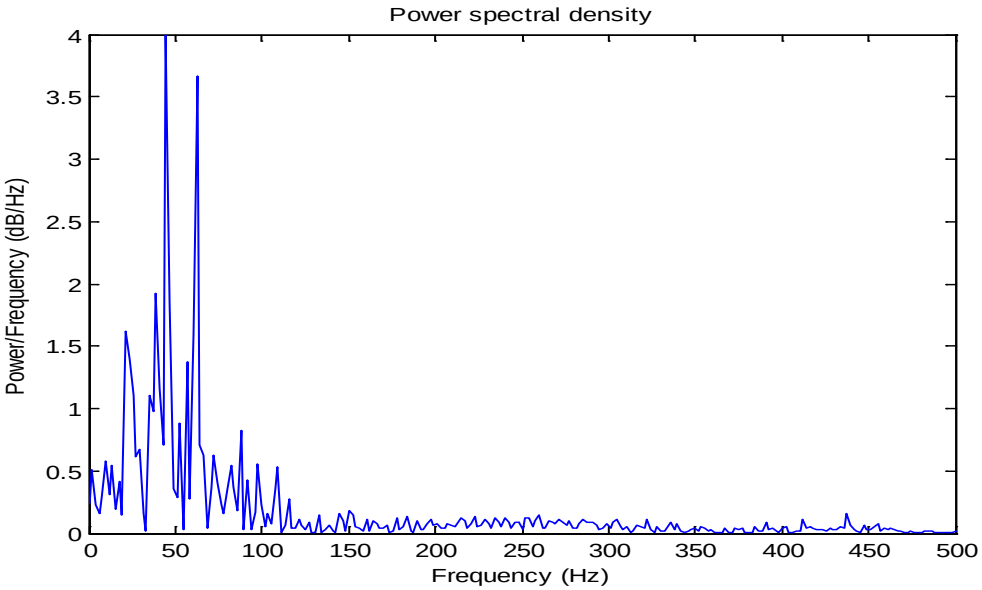


Figure 7: Power spectral density of Neuropathy EMG signal

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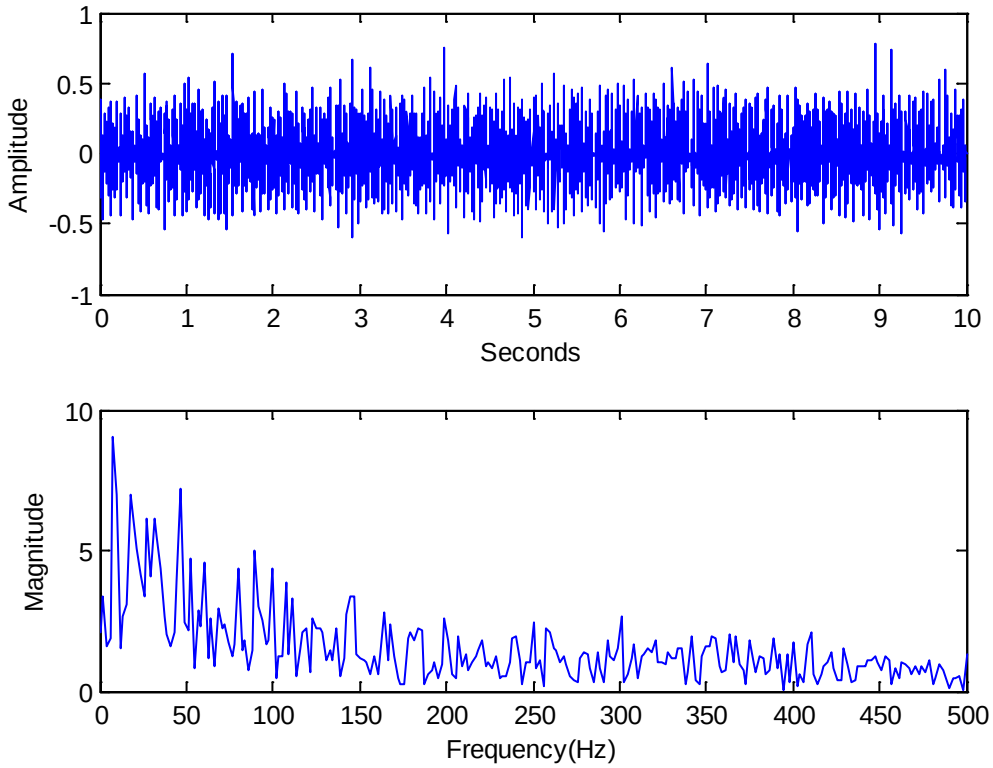


Figure 8: (a) Original Myopathy EMG signal and (b) Frequency domain representation of EMG

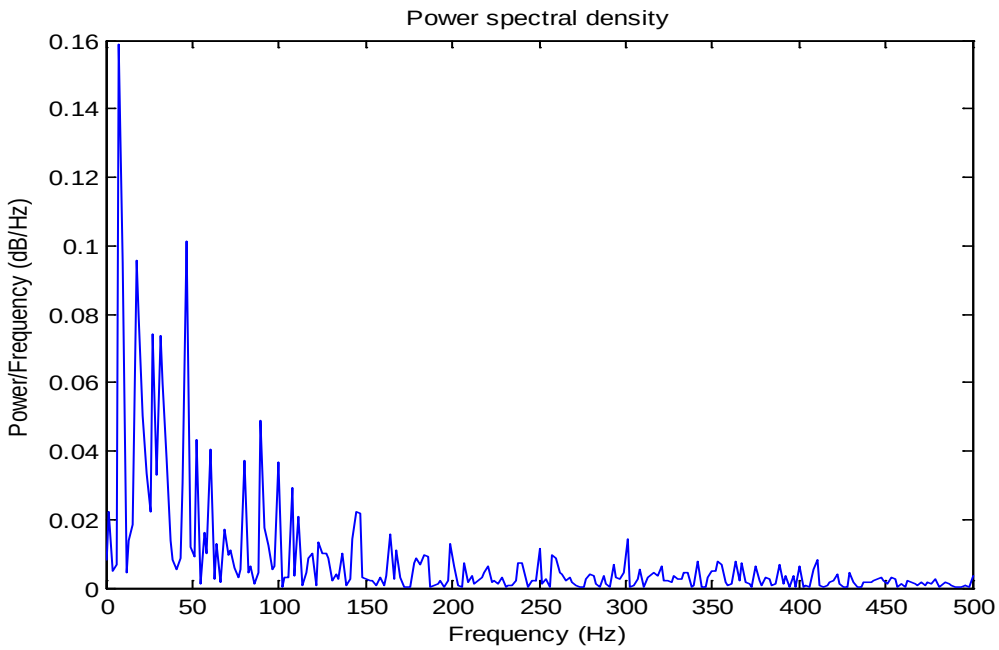


Figure 9: Power spectral density of Myopathy EMG signal

Table 1: Parameters of Different EMG signal analysis

	Healthy	Myopathy	Neuropathy
Median	0	-0.005	0.005
Mean Absolute Value	4.12E-04	6.92E-04	2.27E-04
Root Mean Square	0.082007	0.096274558	0.23254014

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Average Power	0.006725	0.009268791	0.054074917
Max Power Spectrum Magnitude	0.119411	0.158724833	3.991596446
Min Power Spectrum Magnitude	4.92E-07	3.08E-07	7.44E-04

Power spectrum of signal was examined to identify appropriate signal parameters to distinguish signal from respective patients. From power spectrum point of view, any signals can be easily analyzed and classified in terms of amplitude, in terms of power spectral density. Many parameters can be calculated to use as rule base classifier input, which is Mean Absolute Value (MAV), Average Power (AP), amplitude in terms of Root Mean Square (RMS), minimum and maximum power spectral density.

IV. Conclusion

By decomposing of the signal it has been seen that most of the details of the signal are contained at lower scale which need less decomposition, so faster application of the wavelet. The decomposition levels depend on the length of the signal. The absence of very low and very high frequency concentration of the signal helped us to de-noise the signal from movement artifacts and external interfering noise easily. The database signal should be de-noised for detecting features properly. Extracted parameter can be used for classification of signal.

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An Unusual Cause of Stridor after Decannulation of a Tracheostomised Patient

By Sailaja Kambhampati & Meghana Yadav

Abstract- Stridor is commonly seen post decannulation in a tracheostomised patient. Usually it occurs due to airway obstruction secondary to tracheal stenosis, granulation tissue, tracheomalacia. We report a rare case of stridor due to dynamic pharyngeal collapse after decannulation. A 68- year - old male who presented with inferior wall MI and Complete Heart Block had to be put on a mechanical ventilator for hemodynamic instability and subsequently tracheostomised. Post decannulation he developed stridor and breathlessness. CT scan of neck revealed a supraglottic narrowing which on bronchoscopy showed a dynamic collapsibility of supraglottic area. This dynamic collapse was treated with non invasive positive pressure ventilation.

Keywords: *stridor tracheostomy decannulation supraglottic narrowing dynamic pharyngeal collapse*.

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An Unusual Cause of Stridor after Decannulation of a Tracheostomised Patient

Sailaja Kambhampati [α] & Meghana Yadav [σ]

Abstract- Stridor is commonly seen post decannulation in a tracheostomised patient. Usually it occurs due to airway obstruction secondary to tracheal stenosis, granulation tissue, tracheomalacia. We report a rare case of stridor due to dynamic pharyngeal collapse after decannulation. A 68- year -old male who presented with inferior wall MI and Complete Heart Block had to be put on a mechanical ventilator for hemodynamic instability and subsequently tracheostomised. Post decannulation he developed stridor and breathlessness. CT scan of neck revealed a supraglottic narrowing which on bronchoscopy showed a dynamic collapsibility of supraglottic area. This dynamic collapse was treated with non invasive positive pressure ventilation.

Keywords: stridor tracheostomy decannulation supraglottic narrowing dynamic pharyngeal collapse.

I. Case Report

A 68- year -old male was admitted to the hospital for Inferior wall Myocardial Infarction and Complete Heart block. He was a current smoker with 80 pack- years history and a hypertensive and diabetic on treatment. As he was hemodynamic ally unstable he had to be intubated after being taken up for Percutaneous Coronary Angioplasty .As he had to be supported on the mechanical ventilator for a prolonged time with an endotracheal tube he had to be tracheostomised. In view of acute collapse of lung owing to thick tracheobronchial secretions, a good bronchial toileting was done. The patient was subsequently weaned off from the ventilator and then decannulated successfully. The follow-up visits in the OPD were uneventful clinically, but the patient was persistently complaining of progressive breathlessness and stridor. A CT scan of neck was advised and it showed supraglottic narrowing. Suspecting a laryngeal web, a video-assisted bronchoscopy was planned. Findings observed during bronchoscopy were dynamic collapsibility of the supraglottic area, with normal cords and no abnormality noted in the infraglottic area and tracheobronchial tree. The patient was advised nocturnal BIPAP. The patient's symptoms resolved completely and he returned to a normal lifestyle.



Figure 1: CT NECK coronal view showing supraglottic narrowing

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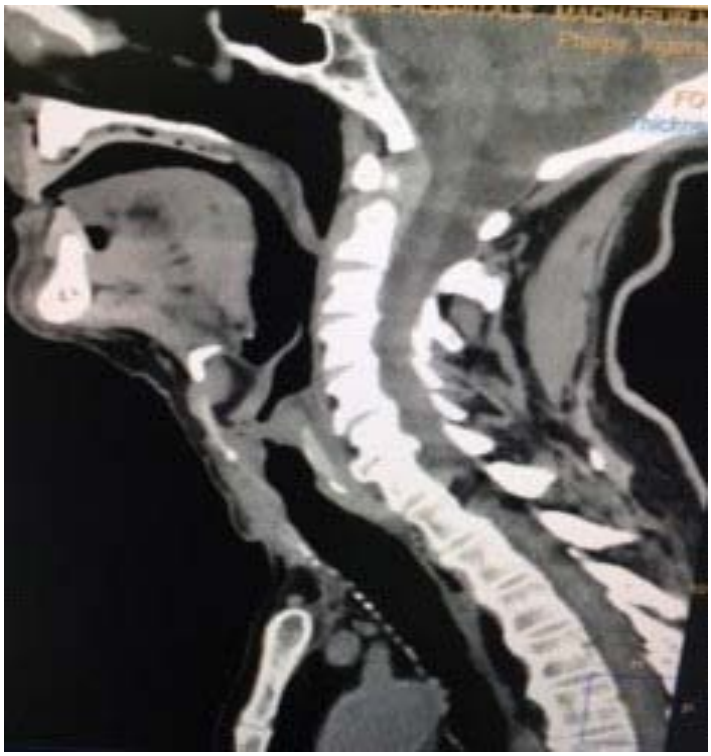


Figure 2: CT NECK sagittal view showing supraglottic narrowing

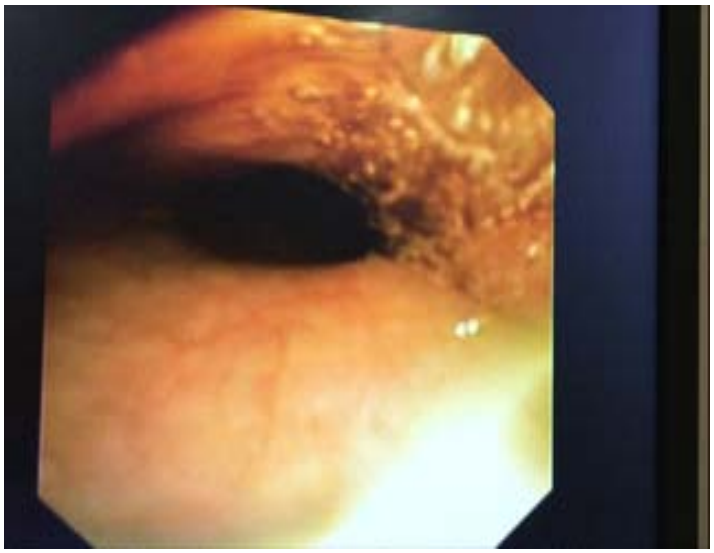


Figure 3: Bronchoscopy showing normal supraglottic airway

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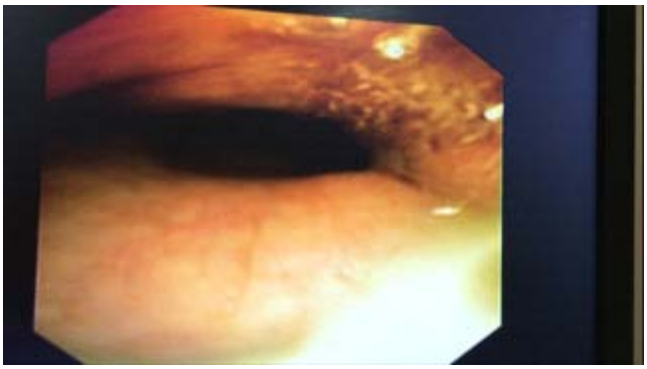


Figure 4: Bronchoscopy showing dynamic pharyngeal collapse

II. Discussion

Stridor in a post decannulated patient usually occurs due to tracheal stenosis, tracheomalacia, granulation tissue, nodules, polyps. The inicidence ranges from 20 to 67% in patients with long term tracheostomy tubes. But dynamic pharyngeal collapse may be an under recognized cause of stridor in post decannulated patient causing respiratory distress. Diagnosis is usually made by fiberoptic bronchoscopy. Treatment includes non invasive positive pressure ventilation.

III. Conclusion

Even though stridor post decannulation is commonly due to tracheal stenosis, tracheomalacia dynamic pharyngeal collapsibility should also be considered as a potential cause. A video-assisted bronchoscopy aids in the detection of the dynamic collapse.

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It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

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).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

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.



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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.



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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.



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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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