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Highlights

Management of Lumbar Spinal Cadaveric Study in a Kenyan

Prosthetic Knee Joint Infection Biochemical Aspects of Preclinical

Discovering Thoughts, Inventing Future

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By Sabrina P. Heglund
University of Alberta

Abstract- This case study paper is written to raise awareness of prosthetic joint infection (PJI) of the right knee following periodontal debridement. The author understands that antibiotic prophylaxis for patients after the two-year post-operative milestone has been a topic of debate for over three decades. However, it is not like winning a lottery when a patient is in the small 2% of the knee prosthetic surgical population which develops a PJI. When prophylactic antibiotics and resistance to them are compared to the actual incidence of the PJI itself, costs cannot be restricted to the healthcare system, the source of income, and lack of mobility during recuperation, but should consider the patient's quality of life and the state of mind during recuperation.

Keywords: antibiotic prophylaxis, periodontal debridement, prosthetic joint infection, hematologic bacteria seeding, oral microbiota.

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Abstract- This case study paper is written to raise awareness of prosthetic joint infection (PJI) of the right knee following periodontal debridement. The author understands that antibiotic prophylaxis for patients after the two-year post-operative milestone has been a topic of debate for over three decades. However, it is not like winning a lottery when a patient is in the small 2% of the knee prosthetic surgical population which develops a PJI. When prophylactic antibiotics and resistance to them are compared to the actual incidence of the PJI itself, costs cannot be restricted to the healthcare system, the source of income, and lack of mobility during recuperation, but should consider the patient's quality of life and the state of mind during recuperation.

Keywords: antibiotic prophylaxis, periodontal debridement, prosthetic joint infection, hematologic bacteria seeding, oral microbiota.

I. Introduction

Antibiotic resistance has been on the rise and has lead to a paucity of antibiotics remaining to fight bacterial infections (Davies & Davies, 2010). All healthcare personnel has been alerted to this fact of preventive medicine, and many guidelines have been arduously researched and published (Little, Jacobson, & Lockhart, 2010). In the case of antibiotic coverage for possible hematological seeding from dental work, patients with artificial joints were given 3 grams of amoxicillin preoperatively for the first two years after the joint was replaced (Seymour, Whitworth, & Martin, 2003). After that, guidelines agreed to by oral medicine practitioners and orthopedic surgeons, recommend the practice be restricted to high- risk patients as the risk for infections in knee replacement surgeries were reduced to 2% of patients receiving dental care (Zimmerli, Trampuz, & Ochsner, 2004). Even in that case, the dental practitioner needed to converse with the orthopedic surgeon and ask for their specific recommendation for the patient they were about to treat. Three years after three monthly reappointments for dental hygiene therapy did not result in a knee infection, this patient was not prescribed antibiotics for his dental hygiene appointment. However, he recently had several gingival surgeries to reduce an oroantral communication from a previous tooth extraction and antibiotics were prescribed post-operatively each time surgery was done. The patient then had this periodontal debridement therapy administered without antibiotics as the current guidelines (Sollecito et al., 2015) suggest, and eight days later succumbed to a prosthetic joint infection (PJI) of the right knee.

The right knee was initially entered in 2011 for total knee arthroplasty (TKA) due to the damage caused by osteoarthritis. In 2015 the patient recalled having severe pain in the right knee and after much physiotherapy was of no help, was returned to the orthopedic surgeon. The diagnosis was that a component of the TKA had worked loose and needed to be repaired. This reparative surgery resulted in an additional 6-8 week loss of wages as was the case after the initial surgery in 2011. The patient had received great relief in the right knee, so he had the left knee corrected with a TKA in 2012 with the same 6-8 week period of not working while recuperating and receiving physiotherapy. The left TKA has not caused any problems over the six years it has been in place. The 69-year-old male patient contracted bacteremia in the right knee and is presently following the orthopedic surgeons gold standard (Petretta, Phillips, & Toms, 2017) of treatment which entails a two-stage treatment of the joint. The first stage is the removal of all hardware and the insertion of a temporary antibiotic cement spacer, and the second stage is re-entry for the placement of the final prosthesis.

II. Method of Diagnosis

The patient found the right knee swollen and extremely painful eight days after the completion of periodontal debridement. It would not bear weight, and the purchase of a set of crutches was needed to attend a medical doctor. Radiographs of the right knee showed inconclusive results of infection or further bone fractures. The physician discussed the history of the right knee with the patient and tentatively asked if he had any dental treatment recently. The patient replied that he had a dental hygiene appointment a week prior which caused the doctor to suspect a bacterial infection, especially with the reported symptoms of swelling, heat, and discomfort on weight bearing. He suggested a course of antibiotics that the patient was to initiate immediately and if there was no relief noted in 48 hours, he was to present to the emergency department of a hospital. Within 32 hours, the pain was excruciating, or 10 on a scale of 10 with ten being more than the patient could tolerate. The patient then reported

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to the emergency department of the hospital where the orthopedic surgeon had originally carried out the TKA's.

The admitting physician in the emergency department took over four hours to attend to the patient and then agreed to call in the orthopedic surgeon. This wait took another two hours and immediately seeing the patient, the surgeon ordered a sterile aspiration kit. Many ounces of fluid were drained off, and one was earmarked for culture and sensitivity testing. The surgeon ordered several radiographs and the patient was admitted overnight with an intravenous (IV) delivery of Cefazalon, a multi- bactericidal cephalosporin antibiotic. Emergency surgery, a two-stage revision of the PJI to remove hardware, took place the next morning following all the protocols specific to that orthopedic surgeon. Four days later the culture identified *Streptococcus mutans* with the antibiotic now being changed to IV Ceftriaxone.

The male patient remained in the hospital for six days then discharged with a peripherally inserted central catheter "PICC" line inserted in his left arm. Outpatient IV antibiotic therapy would be provided for the next six weeks at a hospital closer to the patient's home. Over the next six weeks, blood would be drawn every week to check *C-Reactive Protein* (CRP) and *D-Dimer* levels. The patient was asked to return to the orthopedic surgeon at the 3.5-week post-surgery date for suture removal. After a two-week antibiotic free period, now eight weeks post-surgery, the aspiration of fluid from the surgical area was taken under sedation, and another culture was grown. There was no growth from that culture, so oral antibiotics for a 6-week period was unnecessary. Finally, the date for the revision joint components to be inserted was set 2.5 months after the PJI. For 3.5-weeks after the PJI emergency surgery, the patient wore a knee brace full-time and restricted movement without a two wheeled walker for assistance. At that time, the dressing and sutures were removed. The patient was instructed to use the brace and walker or crutches outside the home to assist with weight bearing and to prevent falls that might breakdown the temporary spacer inserted in the joint.

III. Results at 3.5 Weeks Post PJI Entry

The patient was treated with opioids (hydromorphone, Gabapentin, Trazadone) for pain, acetylsalicylic tablets to prevent bloodclots, diclofenac for arthritis symptoms, and Tramadol for breakthrough pain post-surgery. He has been weaned off the opioids and uses Tylenol for the relief of discomfort as needed which is very rare. The brace was taken off twice a day, and knee bends were attempted. Antibiotic IV therapy occurred daily through the PICC line after his caregiver delivered him to the hospital. Weekly, PICC line dressings were changed and blood samples were collected. The patient reports very slight dizziness upon getting up to standing position, but little or no pain. His activities are limited and he needs care for the functions of daily living of life.

This male who is otherwise in good health and who walks his dog a mile everyday, works three to four days a week, rides a motorcycle in good weather, and putts around the acreage doing all the maintenance has been reduced to an armchair and bed for rest, and walking with a walker or a cane on stairs. Due to the need for a walker, a full-time caregiver assisted with his daily needs. The patient who has always kept his mind busy reading, doing crossword puzzles, and memorizing large tracts of literature for pleasure, seems to lack concentration. He is not getting pleasure out of the mind work and tends to sleep a great deal. The high point of the day was the outing to the IV therapy.

The dressing was taken off at the 3.5- week mark, and the wound had healed well. There is no discharge of any fluids at the site, and the surgeon is pleased with all the lab tests to date. The patient was instructed to use the brace and crutches when outdoors until eight weeks post-surgery. Blood tests were taken when the patient was off all antibiotics and aspiration of fluids was done at that time. If all results were clear, the replacement would be inserted 10 to 12 weeks after this emergency surgery was carried out. The patient is unable to drive or move very freely as a possible fall would complicate the integrity of the temporized joint. The PJI has added up to 5 months of unemployment, the need for a full-time caregiver and the loss of the pleasures of life.

IV. Discussion

Medical science and biomechanical theory have progressed to allow replacements of knees and hips which function well for many years for patients diagnosed with degenerative arthritis. They provide the patient mobility without pain, and the opportunity to carry on with life as he/she sees fit. With the aging population, called baby boomers, there are many more patients presenting with prosthetic replacement joints in need of dental care that they have embraced and cared about until their golden years- any age after 65.

From the 1980s there has been concern that there was a possibility that dental treatment could induce hematological seeding of bacteria in cases of endocarditis in patients with implanted heart valves. From that point on, discussions have been ongoing between the American Heart Association, the dental associations, and the orthopedic associations. Dr. Little (Little et al., 2010) addressed the history of these discussions in great detail. Stated in this discussion was that in 2003, the American Association of Orthopedic Surgeons (AAOS) and the American Dental Association (ADA) came together and published guidelines that did not recommend the need for antibiotic prophylaxis (AP) to patients with joint implants

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prior to undergoing dental treatment as there was insufficient/conclusive evidence for the practice.

In 2009, orthopedic surgeons raised concerns about these prosthetic implants becoming infected from dental manipulations. The AAOS published an information statement: (https://www.aaos.org/AAOSNow/2009/May/cover/ cover2/).

Comprehensive "information statement" puts patient safety first

In February 2009, the AAOS Board of Directors approved the release of the information statement "Antibiotic Prophylaxis for Bacteremia in Patients with Joint Replacements." The new statement asserts that "*Given the potential adverse outcomes and cost of treating an infected joint replacement, the AAOS recommends that clinicians consider antibiotic prophylaxis for all total joint replacement patients prior to any invasive procedure that may cause bacteremia*."

However, as Dr. Little (Little et al., 2010) shows, this statement was only an opinion, and was therefore not supported or underwritten by the ADA.

At present, guidelines from 2003 have been followed resulting in both the AAOS and the ADA agreeing that no AP be routinely provided to patients with prosthetic joint implants. Dental hygienists follow the rule that after two years post implant placement, AP is not required. There is no challenge to this guide as there are few if any scientific studies to prove otherwise. Additionally, the ethics involved to do a rigorous clinical trial study would be nightmarish. In the meantime, patients with implants undergo dental treatment without AP. This male patient succumbed to a PJI as he made up a part of the 2% of patients who are at risk for such an infection.

The rub in this whole issue is that the cost to this patient far outweighs evidence-based practice and far exceeds the level and quality of life to which he has become accustomed. The transport costs, the caregiver costs, the hospital costs, the surgeon costs, the lab testing costs, the daily IV costs, the additional pain medication and probiotic costs, the loss of income, the stress on the body and mind, all cost more than "just" a dollar value. We in health care have been taught to carry out evidence-based practice. We are responsible for doing good and not harming our patients. How do we bear the weight of suffering in this "unlucky" patient who happens to be in the 2% of the patients who will fall prey to PJI? It cannot be justified, but it needs attention. Attention to this issue can be achieved by healthcare workers registering the outliers and reading about the many costs incurred. Prosthetic revision surgery costs are possibly four times more than the original surgery for the joint implant.

V. Conclusion

This manuscript has been written to draw attention and raise awareness of the fact that even in evidence-based practice, there is always a chance for ill effects to a certain number of patients. A full medical and dental history updated at every appointment may take time away from the task at hand. In the grand scheme of things, that time may save the few patients at risk for PJI from having to undergo such costs. These case studies do not bear much weight as they are "rare" occurrences. But the suffering of this patient must not go unnoticed. A complete patient history of recent dental procedures done for this patient could have avoided the above outcomes. Prediction of the need for AP prior to dental procedures are difficult to determine when given strict guidelines. It is hoped that this case study will encourage conversations with the patient about the suggested guidelines and his/her preference for AP prior to undergoing dental treatment.

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Location of the Axillary Nerve in Relation to Arm Length: A Cadaveric Study in a Kenyan Adult Population

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Abstract- *Background:* The location of the axillary nerve from various bony landmarks has been described in the literature. Such descriptions can assist the surgeon to avoid iatrogenic injury to this nerve during deltoid splitting approaches to the shoulder and proximal humerus.

Objective: To investigate the relationship between the axillary nerve and arm length in a cadaveric adult Kenyan population.

Methods: The distance of the axillary nerve from important bony landmarks such as the anterior and posterior edges of the acromion, and the lateral epicondyle of the humerus were measured and recorded.

Keywords: *axillary nerve, arm length.*

GJMR-H Classification: *NLMC Code: WE 168*



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Methods: The distance of the axillary nerve from important bony landmarks such as the anterior and posterior edges of the acromion, and the lateral epicondyle of the humerus were measured and recorded.

Results: A total of fifty-one formalin prefixed left adult upper limbs were studied. The average distance of the nerve from the anterior and posterior edges of the acromion (AEA and PEA respectively) were 6.46cm (range 5.15-8.68cm) and 5.88cm (range 4.42-9.99cm) respectively. The average arm length (AL) was 31.96cm (range 27.29-38.74cm). A 1cm rise in AL had a predictable increase in nerve distances from anterior and posterior edges of the acromion by 0.104cm and 0.062cm respectively.

Conclusions: The nerve was located a minimum distance of 5.15cm and 4.42cm from the anterior and posterior edges of the acromion respectively.

Keywords: axillary nerve, arm length.

I. Introduction

The axillary nerve originates from the posterior cord of the brachial plexus. It then descends inferolaterally on the surface of subscapularis muscle to end in the quadrangular space by dividing into its two terminal divisions – the anterior and posterior (1, 2). The nerve supplies the shoulder joint, deltoid and the teres minor muscles.

Injury to this nerve can cause significant functional impairment such as limitation in shoulder abduction (3, 4). Axillary nerve injuries have been reported to be around 10% of all brachial plexus injuries (4). Trans-deltoid incisions or approaches to the proximal humerus and the shoulder joint such as open reduction internal fixation (ORIF) of proximal humerus fractures, and openrotator cuff repair places this nerve at increased risk of injury either through transection or traction (3).

Traditionally, the axillary nerve is described to lie about 5cm from the edge of the acromial process of the scapula. This measurement, however, has individual variability and differs from study to study (3, 5, 6).

II. Materials and Methods

This study conducted at the Human Anatomy laboratory of Moi University after ethical clearance from the Institutional Research and Ethics Committee (I.R.E.C) of Moi University. Fifty-one formalin prefixed left adult upper extremities disarticulated at the scapulothoracic junction were used. Only the left limbs were used since these were the majority.

Dissections were done using the deltopectoral approach to demonstrate the origin, course, and distribution of the axillary nerve beneath the deltoid muscle. A digital calibrated caliper [(Neiko® Tools Digital Caliper serial number 0.3.04.0487ECC) accurate to 0.01mm] was used to measure individual arm lengths and the lengths of the axillary nerve.

Hypodermic needles were introduced through the axillary nerve. This was to help in the representation of the course of the nerve on the outer surface of deltoid muscle and to minimize errors during subsequent measurements.

The distance from the acromion lateral edge to the lateral epicondyle of the humerus was measured and recorded as the arm length (AL).The course of the axillary nerve was represented on the outer surface of the deltoid muscle using hypodermic needles. A digital caliper was used to measure the distance from the anterior edge of the acromion (AEA) to the axillary nerve and recorded as the anterior distance (AD) as illustrated in figure 1 below.

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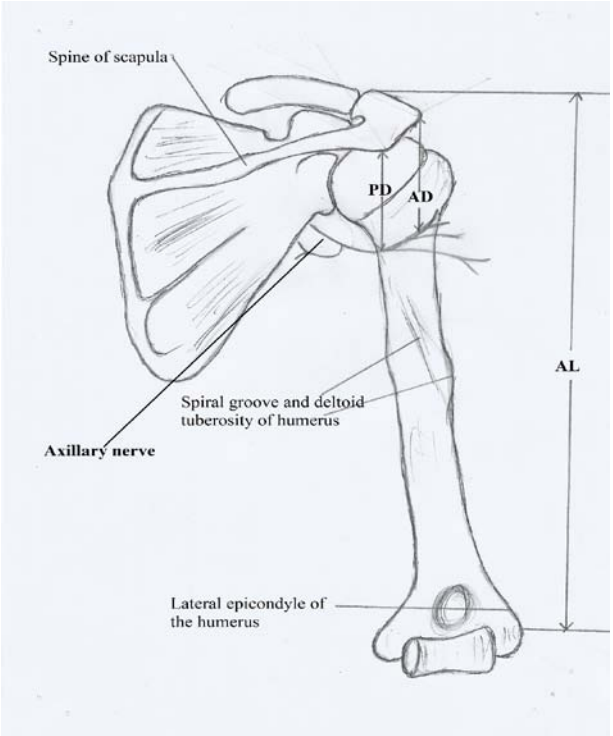


Figure 1: Measurements used to map out the axillary nerve (AL, arm length; AD, anterior distance from anterior edge of acromion to axillary nerve; PD, posterior distance from posterior edge of acromion to axillary nerve).

The distance from the posterior edge of the acromion (PEA) to the axillary nerve was measured and recorded as the posterior distance (PD). All measurements taken recorded in centimeters (cm). Correlation analysis was then performed between arm length (AL), and the anterior and posterior distances.

The ratio between arm length (AL) and the anterior distance (AD) was calculated for each cadaver and recorded as the anterior index (AI) which is the distance of the nerve from the anterior edge of the acromion divided by arm length, i.e. $AI = \frac{AD}{AL}$. Also, the ratio between arm length (AL) and the posterior distance (PD) was calculated and recorded as the posterior index (PI) which is the distance of the nerve from the posterior edge of the acromion divided by arm length, i.e. $PI = \frac{PD}{AL}$.

The distance of the nerve from important bony landmarks such as the anterior and posterior edges of the acromion, and lateral epicondyle of the humerus were measured and recorded in structured data collection forms. Data were then entered into a Microsoft® Excel® database and exported to SPSS version 21 for Windows® (SPSS, Chicago, IL, USA) for analysis.

III. Results

The average anterior distance (AD) was 6.46cm (SD 0.7cm) with a range of 5.15cm – 8.68cm. The average posterior distance (PD) was 5.88cm (SD 0.95cm) with a range of 4.42cm – 9.99cm.

Table 1: Axillary nerve distances from the acromion process of the scapula (AD-anterior distance, PD-posterior distance, AL-arm length).

Number	Parameter	Range (cm)	Mean ±SD, n=51
1	AD	5.15 – 8.68	6.46 (0.70)
2	PD	4.42 – 9.99	5.88 (0.95)
3	AL	27.29 – 38.74	31.96 (2.27)

The arm length (AL) had a mean of 31.96cm (SD 2.27cm) with a range of 27.29cm – 38.74cm as shown below.

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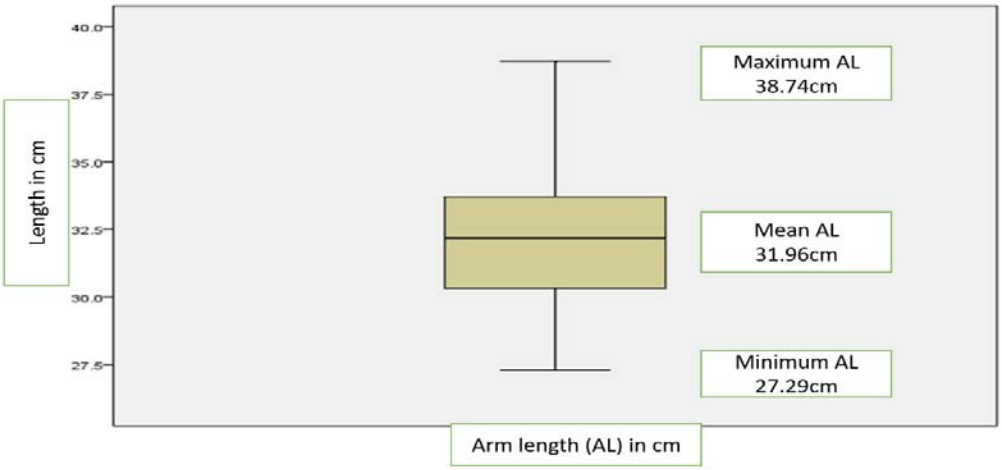


Figure 2: Average arm length (AL).

There was a significant correlation between AD and AL (r= .335; p=0.016), where AD is expected to significantly (p=0.016) increase by 0.104cm for every 1cm increase in AL.

The correlation between PD and AL (posterior index, PI) was not statistically significant (r=0.147; p=0.304). A regression model fitted on the same shows that PD is predicted to increase by 0.062cm for every 1cm increase in AL. However, this change is not statistically significant (p=0.304). The average AI and PI were 0.2±0.022cm (range 0.157- 0.253cm) and 0.185±0.033 (range 0.14-0.35cm) respectively.

IV. Discussion

From the present study, the average anterior distance (AD) was 6.46cm (range 5.15-8.68cm) while the average posterior distance (PD) was 5.88cm (range 4.42-9.99cm). The arm length had a mean of 31.96 cm (range 27.29-38.74cm). Statistical analysis of these measurements revealed that for the AI, for every 1cm increment in the arm length, the AD was predicted to increase by 0.104cm (p=0.016). This increment represented a significant change. While for the PI, for every 1cm increase in the arm length, the PD was predicted to increase by 0.062. This data did not represent a significant change (p=0.304).

The findings above are similar to those described by Cetik et al., (2006) on 24 embalmed adult cadaveric shoulders (3). The authors reported that the axillary nerve curved inferior to the anterior and posterior edges of the acromion process at an average distance of 6.08cm and 4.87cm respectively. They found a significant correlation between arm length and both the anterior ($r = 0.79$, $p < 0.001$) and posterior distances ($r = 0.61$, $p = 0.001$) respectively.

In a cadaveric study of 30 shoulders by Abhinav et al., (2008), the distance of the axillary nerve from the lateral edge of the acromion was measured in varying degrees of adduction and abduction of the shoulder joint. The average arm length (AL) was 31.0cm (range 27-34.5cm), with the axillary nerve located at an average length of 6.0cm (range 4.5-6.5cm) from the lateral edge of the acromion. This distance reduced significantly when the arm in an abducted position. Abduction moved the nerve closer to the acromion thereby putting the nerve at risk during surgery(6). The present study did not consider the nerve distances with abduction or adduction due to the stiff nature of the cadaveric specimens.

Liu et al., (2011) studied 44 embalmed adult cadaveric shoulders and found that the arm length varied amongst the Chinese and Caucasian populations. The average arm length ranged from 23.3-33.3 cm in their study. These lengths are shorter in comparison to those found in this present study because of the shorter stature of the adult Chinese in comparison to the adult Kenyan. Therefore, to avoid iatrogenic injury to the axillary nerve during drilling and screw insertion, drill guide protective systems should be placed directly on the bone during open reduction and internal fixation (O.R.I.F) of proximal humerus fractures (7).

In the current study, the average anterior (AI) and posterior indices (PI) were 0.20 (range 0.157-0.253) and 0.185 (range 0.14-0.35) respectively. These findings are similar to those reported by Cetik et al., (2006) who found figures of 0.20 and 0.16 for AI and PI respectively (3).

From the present study, a quadrangular safe area or zone which is located above the axillary nerve can be useful and safe during deltoid splitting incisions in proximal humerus fractures, intramuscular injections, and shoulder arthroscopy. This quadrangular shaped area is similar to that described by Cetik et al., (2006) as shown in figure 3 below.

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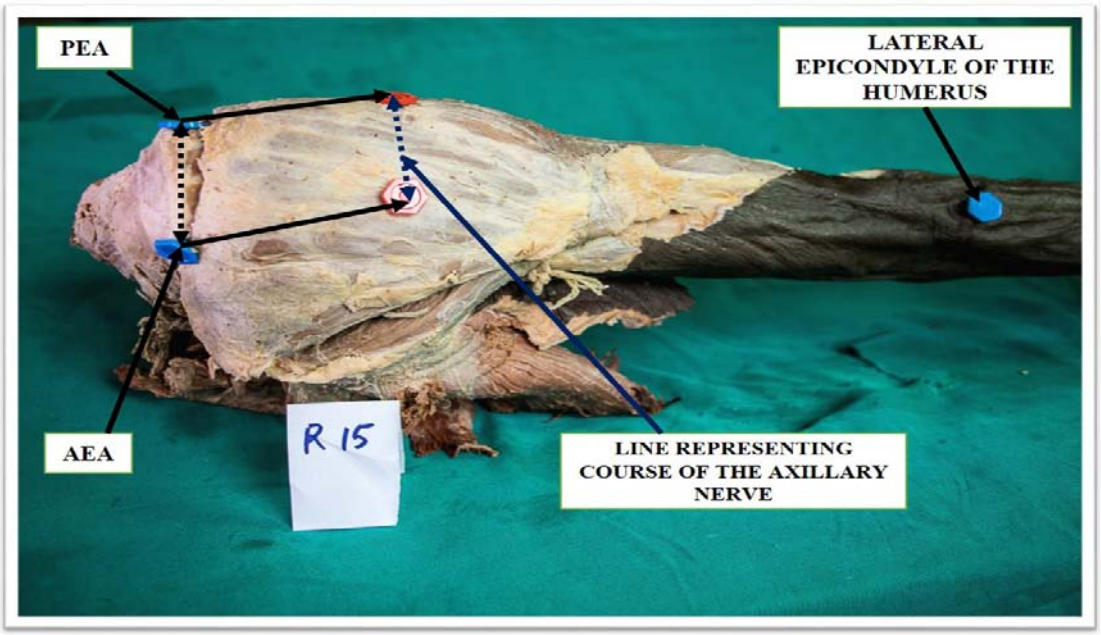


Figure 3: Photograph showing the quadrangular shaped safe area for deltoid dissections. (AEA- anterior edge of acromion; PEA- posterior edge of acromion).

Finally, the use of deltoid ratio, i.e. length and width of the deltoid muscle versus the distance from the acromion to the axillary nerve can be used to predict the location of the axillary nerve preoperatively (8). However, from the present study, measuring the deltoid length and width intraoperatively is a difficult task for the surgeon. The surgeon is advised to use easily palpable bony landmarks, i.e. the acromion process of the scapula (both the anterior and posterior edges), and the lateral epicondyle of the humerus to easily predict the course of the axillary nerve.

V. Conclusion

A 1cm rise in arm length had a predictable increase in nerve distances from anterior and posterior edges of acromion by 0.104 cm and 0.062 cm respectively.

A preoperative template of a quadrangular "safe zone/ area" as landmarks on the proximal deltoid muscle using minimum distances of 5.15cm and 4.42cm from anterior and posterior edges of acromion process of the scapula respectively should protect the axillary nerve and its branches during surgery.

Conflict of Interest

The author(s) declare (s) that there is no conflict of interests regarding the publication of this paper.

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Biochemical Aspects of Preclinical Prediction of the Severity of the Knee Joint Injuries in Acute Period

By Murod Karimov, Feruza Inoyatova, Umid Kholmurodov & Kirill Tolochko

Abstract- Early detection of markers of joint damage in order to predict the course of the inflammatory process and the risk of developing post-traumatic osteoarthritis is one of the urgent problems of traumatology and orthopedics. Determining the molecules of average mass and necrotic substances in the hemosynovial fluid of the injured knee joint demonstrates a significant association with the severity of the injury, the severity of the inflammatory process and the progression of post-traumatic osteoarthritis. Increasing the level of necrotic substances in hemosynovial fluid to 1.6-2.0 U/ml, 45.4% corresponds to significant damage to the intra-articular structures and leads to the development of the inflammatory process; an increase in excess of 2.0 U/ml is an indicator of severe joint injury and leads to a complicated postoperative course.

Keywords: osteoarthritis; endotoxicosis; anterior cruciate ligament rupture; hemosynovial fluid; knee-joint injuries; hemarthrosis.

GJMR-H Classification: NLMC Code: WE 348



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Biochemical Aspects of Preclinical Prediction of the Severity of the Knee Joint Injuries in Acute Period

Murod Karimov [α], Feruza Inoyatova [σ], Umid Kholmurodov [ρ] & Kirill Tolochko [ω]

Abstract- **Early detection of markers of joint damage in order to predict the course of the inflammatory process and the risk of developing post-traumatic osteoarthritis is one of the urgent problems of traumatology and orthopedics. Determining the molecules of average mass and necrotic substances in the hemosynovial fluid of the injured knee joint demonstrates a significant association with the severity of the injury, the severity of the inflammatory process and the progression of post-traumatic osteoarthritis. Increasing the level of necrotic substances in hemosynovial fluid to 1.6-2.0 U/ml, 45.4% corresponds to significant damage to the intra-articular structures and leads to the development of the inflammatory process; an increase in excess of 2.0 U/ml is an indicator of severe joint injury and leads to a complicated postoperative course. The defined markers are the products of deep cell destruction, the level of necrotic substances increases during inflammatory and destructive processes and is used as a marker of endotoxicosis processes with high prognostic efficacy (specificity: 89.5%).**

Keywords: osteoarthritis; endotoxicosis; anterior cruciate ligament rupture; hemosynovial fluid; knee-joint injuries; hemarthrosis.

I. Introduction

In most cases, acute injury of the knee joint is accompanied by the appearance of hemarthrosis, the causes of that damage to the meniscus, dislocation of the patella, damage to the cartilage and subchondral fractures [1, 2]. Trauma is a proven risk factor for osteoarthritis (OA), which leads to disability [3, 4]. According to the literature, after a meniscus rupture requiring surgical intervention, OA develops in 50% of cases in patients [5].

Studies of the molecular mechanisms of the development of post-traumatic OA have shown the leading role of the activation of pro-inflammatory cytokines (IL-1 and TNF-α) in the focus of damage [6]. The effect of intra-articular fractures on inflammation of the synovial membrane remains unknown, although synovial pathology is crucial in the development of various forms of OA [1, 9].

Assessment of post-traumatic hemarthrosis of the knee joint only by clinical methods cannot demonstrate the seriousness of the injury. In such cases, arthroscopy is invaluable for the determination of concomitant damage and is significantly superior in magnitude to magnetic resonance imaging (MRI). The advantage of arthroscopy is at the same time carrying out not only diagnostic, but also medical procedures [7].

It should be noted that currently there are no prognostic biochemical markers that can reliably predict the course of the inflammatory process and the severity of injuries. In this regard, the identification of early markers of joint damage, prediction of the inflammatory process and the risk of OA is one of the urgent problems of traumatology. Identification of biomarkers potentiating the development of the inflammatory process and OA has so far focused mainly on matrix degradation products and, as a rule, in individuals with established OA. Although some biomarkers show statistically significant associations with the severity of injury and the progression of post-traumatic OA [8], however, no clear criteria for preclinical prediction have yet been developed. So, according to the growth of the content of individual cytokines (IL1, IL6, TNF-α), the activity of the inflammatory process in the joints is judged [9]; however, it is practically impossible to speak about their effector functions [10]. The known method determines the nature of the course of post-traumatic hemarthrosis according to the biochemical parameters of the synovial fluid: seromucoid level, markers of lipid oxidation, antioxidant activity and inflammation [11, 12], but their prognostic significance has not been established.

The purpose of the research is to evaluate the diagnostic and prognostic significance of the content of oligopeptides (E-254) and necrotic substances in hemosynovial fluid, for preclinical assessment of the severity of injury to the knee joint in the acute period before arthroscopy.

II. Materials and Methods

To accomplish this goal, we were researching on 20 patients with posttraumatic hemarthrosis who received treatment in the Department of Traumatology of the 2nd TMA clinic. Patients were predominantly male (16 men and 4 women). The average age of patients was 36.6±2.9 years (from 18 years to 47 years); the

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largest number of patients falls on the age group of 24-36 years, patients of young working age. In 80% of cases, the injury had a household character. All patients were examined shortly after the injury of the knee joint, the average time from the moment of injury to the examination was 3 days. Inclusion criteria were clinically significant acute knee injury in the last 3 weeks; effusion of the knee joint, confirmed clinically and with MRI; the presence of ≥1 specified structural injury on MRI (Siemens, 1.5 Tesla). Exclusion criteria were the presence of pronounced OA of the knee joint (III-IV degree according to Kellgren-Lawrence, 1978); inflammatory/septic arthritis of the affected knee; active or treated systemic inflammatory disease; recent infection; pregnancy.

All patients had baseline clinical signs of hemosynovitis and MRI findings. A number of structural injuries of the knee in a group of patients were classified after arthroscopic surgery with an addition to the conclusion of an MRI. The most common types of injury were a meniscus rupture, anterior cruciate ligament rupture (ACLR), or simultaneous injury. Of the total number of patients in 100% surgical treatment was carried out, 95% of them <24 hours after admission to hospital treatment.

All types of injuries were identified and listed an increasing order of injury, diagnosed using arthroscopy (Karl Storz arthroscopic stand) and MRI. Severe injury was defined as a combined torn ligament (>1), meniscus damage, fracture or dislocation. Clinically, the volume of effusion was assessed as small (up to 50 ml), medium (up to 250 ml) or large (over 250 ml).

When arthroscopy was carried out to patients, in addition to the diagnostic purpose, and therapeutic manipulations, the state of the synovial membrane and the cartilage cover of the knee joint was assessed. Assessment of knee joint case was carried out according to the following criteria:

- The state of the menisci.
- Gap nature was evaluated according to the classification of the ISAKOS Classification of meniscal tears (2011).
- With the definition of the location.
- Nature and features of the gap.
- Cartilage layer condition of the knee joint was assessed by Bauer and Jackson (1988) as the classification, most suitable for the assessment of acute injury.
- The state of Hoff's body.
- The presence of a bruise, hematoma, local structure disorder.
- In case of acute injury, the synovial membrane has signs of damage in the form of a hematoma;
- The presence of bleeding vessels, swelling of synovial villi.
- The presence of hemosynovial fluid, volume and character.

Upon admission to inpatient treatment, a puncture of the knee joint was performed, and the accumulated synovial fluid was collected with a sterile syringe. In the synovial fluid, the average molecular weight (AMW) content after precipitation of proteins with trichloroacetic acid (TCA) was determined by spectrophotometric ways on 254 nm wavelength. The result was expressed in units of optical density. The content of necrotic substances in the synovial fluid was determined after precipitation of proteins with 5% perchloric acid on a spectrophotometer at a wavelength of 260 and 320 nm against perchloric acid. The difference in optical density (Eλ260-Eλ320)*10 corresponds to the value of the value of necrotic substances per 1 ml of synovial fluid [13]. Digital material processed by the method of variation statistics.

III. Results and Discussion

Studies have shown that in the synovial fluid of victims with a knee joint injury and post-traumatic hearthrosis, the content of AMW and necrotic substances varies widely (AMW - from 0.256 to 0.440 U/ml and necrotic substances from 1.19 to 2.73 U/ml), averaging 0.350±0.013 U/ml and 1.880±0.101 U/ml (Table 1). This was due to the heterogeneity of the examined patients, the severity of damage to the knee joint.

In this regard, we compared the indicators of AMW and necrotic substances with the data of arthroscopy of the knee joint. At the same time, the severity of inflammation was taken into account with an assessment of damage to the intra-articular structures, cartilage, synovial membrane, hemarthrosis volume. Depending on arthroscopic picture of knee joint and level of necrotic substances in the synovial fluid, patients were divided into 3 groups. Values up to 1.5 E/ml were assessed as a normal, with minimal signs of inflammation, no damage in intra-articular structures (menisci, cartilage, ligaments), edema of the synovial membrane, small volume of hemarthrosis (1st group). Values in excess of 1.5 E/ml, but below 2 E/ml was as a sign of inflammation in an affected joint, corresponding to isolated meniscus injury, ligaments, cartilage damage – according to Bauer and Jackson (1988) type I-III, moderate hemarthrosis (2nd group). Values over 2.0 E/ml were a sign of pronounced inflammatory process with progressive course that suitable to severe injury, with simultaneous damage of several intra-articular structures, hematoma of synovial membrane, the presence of severe chondral and subchondral injuries with cartilage damage. According to Bauer and Jackson (1988), it was appropriate to type IV, with the formation of free bodies inside the joint cavity (3rd group). The distribution of patients into groups showed that only 3 victims had no signs of inflammation and damage to the joint, 11 injuries had arthroscopically isolated injuries and 6 patients had severe injuries of the knee joint.

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Table 1: Content of AMW and necrotic substances in synovial fluid of patients with a knee joint injury, M±m

Groups	Quantity	Medium-Weight Molecules, E/ml	Necrotic Substances, E/ml
Overall	20	0,350±0,013	1,880±0,101
1st group (from 1,5 E/ml)	3	0,289±0,019	1,333±0,081
2nd group (1,6-2,0E/ml)	11	0,338±0,015	1,708±0,051
3rd group (up to 2,0 E/ml)	6	0,403±0,014	2,493±0,063

Detailed analysis of AMW indicators and necrotic substances in the synovial fluid of the knee joint showed that the content of AMW ranged from 0.256 to 0.322 U/ml, averaging 0.289±0.019 U/ml. While the level of necrotic substances varied within narrow limits (1.19–1.47 U/ml), averaging 1.333±0.081 U/ml. Arthroscopically, any breaks of meniscus, cartilage damage, or ligaments were not identified in this group of patients. Only 1 patient was diagnosed with a contusion and hematoma of the body of Hoff and a hematoma in the synovial membrane, as well as hemarthrosis with small volumes of fresh blood poured out (33.33±3.33 ml).

In 2nd group patients, the level of AMW varied from 0.276 to 0.422 U/ml, averaging 0.338±0.015 U/ml. The content of necrotic substances ranged from 1.52 to 2.00 U/ml, making up 1.708±0.051 U/ml. Arthroscopically, there were observed in 27.3% of cases complete and in 72.7% of the partial meniscus gap, in the main first zone. According to the classification of Bauer and Jackson (1988), lesions of cartilage were shown I-III degree, incomplete rupture of ligaments and PKS, contusions of Hoff's body and in 54.5% of cases with hematomas with fresh blood of 177.27±25.30 ml.

In the 3rd group there were 6 patients. Indicators of AMW in synovial fluid varied within 0.345-0.440 U/ml, making up 0.403±0.014 U / ml, necrotic substances were from 2.30 to 2.73 U/ml, making up 2.483±0.063 U/ml.

Arthroscopically, all patients of this group were found to have a complete rupture of 3 zones of meniscus, damage to the 4th degree cartilage, complete rupture of the ligaments (combination of damage to the ACLR and medial collateral ligament (MCL). Bruises and hematomas of van't Hoff's body, the synovial membrane with hematomas and bleeding vessels, the presence of fresh blood with clots was detected in a volume of 368.33±14.47 ml.

As can be seen from the above data, biochemical indicators of synovial fluid indicated the presence of significant damage in the knee joint. However, it should be said that, in contrast to the content of AMW, mainly reflecting the increased proteolysis at the site of damage, the level of necrotic substances largely (completely) coincided with the degree of damage to the structural components of the knee joint. In our opinion, this is due to the fact that necrotic substances are products of deep destruction of cells of the body and represent a pool of components of the breakdown of nucleic acids that are able to absorb light in the ultraviolet region of the spectrum. According to the literature, the level of necrotic substances increases during inflammatory and destructive processes and is used as a marker for endotoxicosis processes. In studies taking into account the above, we analyzed the postoperative period in the patients we examined. Studies have shown that in the group of patients with a low level of necrotic substances in the postoperative period there was no development of complications. In the second group with the level of necrotic substances in the range of 1.6-2.0 U/ml in 45.4% of cases, mild inflammatory reactions developed, which were treated accordingly. The values of necrotic substances in these patients corresponded to 1.8-2.0. In the third group of victims, the values of necrotic substances exceeded 2.0 U/ml, which was predicted for a complicated course of the postoperative period, and therefore these patients were treated accordingly.

On the basis of the obtained data, we analyzed the diagnostic specificity of determining the content of necrotic substances, this indicator was 89.5%, which indicates its high predictive efficiency.

IV. Conclusion

1. In patients with damage to the knee joint, the content of AMW increases in the hemosynovial fluid, the severity of which coincides with the arthroscopic picture of the damaged joint.
2. Determination of necrotic substances in synovial fluid is a prognostic marker of severity of damage to structural components of the knee joint. Diagnostic efficacy was 89.5%.
3. The content of necrotic substances in hemosinovial fluid predicts early, preclinical diagnosis of post-traumatic osteoarthritis of the knee joint.
4. The use of a biochemical marker not only diagnoses the severity of damage to the knee joint, but also predicts the course of the postoperative period.

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Functional Outcome of Surgical Management of Lumbar Spinal Stenosis

By Hitesh Sehrawat, Amit Dwivedi, Tushar Sachdev & Vikram Dagar

Santosh Medical College & Hospital

Abstract- *Aims and Objectives:* To determine the functional outcome after surgical management of lumbar spinal stenosis.

Materials and Methods: In this study 20 patients of lumbar spinal stenosis were enrolled. All the Patients were managed with three different surgical techniques according to pre-formulated indications. JOA scoring system for low backache was used to assess the patients. The recovery rate was calculated as reported by Hirabayashi et al. (1981). Surgical outcome was assessed on the recovery rate and was classified using a four grade scale: Excellent, improvement of >90%; good, 75–89% improvement; fair, 50–74% improvement; and poor, below 49% improvement. The patients were evaluated post-op at 3 months, 6 month and one year follow-up.

Results and Discussion: Total 50% patients were having good functional outcome whereas 10% had excellent outcome. Fair outcome was observed in 35% patients and poor in 5% patients.

Keywords: *spinal stenosis, Japanese orthopedic association score, recovery rate.*

GJMR-H Classification: *NLMC Code: WE 725*



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Abstract- *Aims and Objectives:* To determine the functional outcome after surgical management of lumbar spinal stenosis.

Materials and Methods: In this study 20 patients of lumbar spinal stenosis were enrolled. All the Patients were managed with three different surgical techniques according to pre-formulated indications. JOA scoring system for low backache was used to assess the patients. The recovery rate was calculated as reported by Hirabayashi et al. (1981). Surgical outcome was assessed on the recovery rate and was classified using a four grade scale: Excellent, improvement of >90%; good, 75–89% improvement; fair, 50–74% improvement; and poor, below 49% improvement. The patients were evaluated post-op at 3 months, 6 month and one year follow-up.

Results and Discussion: Total 50% patients were having good functional outcome whereas 10% had excellent outcome. Fair outcome was observed in 35% patients and poor in 5% patients. 55% patients in the study were having JOA scores less than 19 preoperatively. On post operative 3rd month 75% patients had scores 20 and above whereas on post operative 6th month, the proportion was increased to 95%. On post operative one year all patients had scores more than 20.

Conclusion: Surgical treatment in patients of lumbar spinal stenosis yields good to excellent results as observed on the basis of JOA scoring system.

Keywords: spinal stenosis, Japanese orthopedic association score, recovery rate.

I. Introduction

Spinal stenosis is the narrowing of the spinal canal, the lateral nerve root canals, or the neural foramen. This narrowing derives from facet or ligament umflavum hypertrophy, extruded disc, spondylolisthesis or any combination of the above. It may form part of a generalized degenerative process at several spinal levels or may be more localized.

In lumbar spinal stenosis, spinal canal narrows and leads to compression on the spinal cord and nerve roots. Symptoms include low back pain, neurological claudication and neurological deficit.

Prolapse intervertebral disc occurs in about 5-10% of all low backache patients and is a common cause of sciatica. Disc prolapse alters the disc height and mechanics of the rest of the spinal column, possibly adversely affecting the behavior of other spinal structures such as muscles and ligaments. The standard treatment of prolapsed lumbar disc has been surgical excision of the disc or conservative treatment, though the methods vary.

The first disc prolapse operation falsely accredited to Mixter and Barr was conducted by Oppenheim and Krause in Berlin but it was interpreted as an enchondroma of spinal disc. Mixter and Barr's[1] classical paper "Rupture of inter vertebral disc with involvement of spinal canal" opened an era of systematic diagnosis and operative treatment of lumbar disc prolapse. Their approach showed the effectiveness of Laminectomy and Discectomy in its management and since then there has been an ever increasing enthusiasm to solve sciatica problems surgically by disc excision. Although minimally invasive operations such as percutaneous nucleotomy[2,3] and microendoscopic[4] discectomy have gained attention in recent years, standard discectomy is still the preferred management technique among the majority of surgeons, and its favorable outcomes and affordability have been reported.[5]

Other mode of treatment, "active" nonoperative treatment is also used, except in patients with progressive neurologic deficit and cauda equina syndrome, both of which are indications for urgent decompression[6]. Hence any surgical intervention without appropriate conservative therapy leads to unnecessary surgery and also a poor outcome.[7]

With the basic understanding of disease process, new diagnostic techniques, refinements in conservative treatment and discectomy, improvements in surgical instrumentation revealed that surgical removal of the offending disc herniation is reasonably safe procedure with satisfactory results. Mortality of this surgery is almost negligible. Thus the present study was undertaken to study the functional outcome of the surgical management of degenerative lumbar canal stenosis.

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JOA SCORE

1) Low Back Pain		
A	None	3
B	Occasional, Mild	2
C	Frequent Mild or Occasional Severe	1
D	Frequent, Severe	0
2) Leg Pain		
A	None	3
B	Occasional Mild Leg Pain or Numbness	2
C	Frequent Mild or Occasional Severe Leg Pain or Numbness	1
D	Frequent Severe Leg Pain or Numbness	0
3) Gait		
A	Normal	3
B	Able to Walk >500 M With Leg Pain or Numbness	2
C	Able to Walk For 100- 500 M	1
D	Unable to Walk > 100m	0
4) Straight Leg Raising Test		
A	Normal	2
B	30-700	1
C	< 300	0
5) Sensory Deficit		
A	Normal	2
B	Slight Disturbance	1
C	Severe Disturbance	0
6) Motor Deficit		
A	Normal	2
B	Motor Power > Grade Iii	1
C	Motor Power <= Grade Iii	0
7) Turn Over While Lying		
A	Easy	2
B	Difficult	1
C	Impossible	0
8) Standing Up		
A	Easy	2
B	Difficult	1
C	Impossible	0
9) Washing Face		
A	Easy	2
B	Difficult	1
C	Impossible	0
10) Leaning Forward		
A	Easy	2
B	Difficult	1
C	Impossible	0
11) Sitting About 1 Hour		
A	Easy	2
B	Difficult	1
C	Impossible	0
12) Lifting Heavy Weight		
A	Easy	2
B	Difficult	1
C	Impossible	0
13) Running		
A	Easy	2
B	Difficult	1
C	Impossible	0
Maximum Joa Score		29
Minimum Joa Score		0

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II. Material and Methods

The present study was conducted during Jan 2016 to Feb 2017 in santosh hospital, ghaziabad. Total 20 patients of lumbar spinal stenosis were enrolled in the study using following inclusion and exclusion criteria.

a) Inclusion Criteria

- Patients aged 50-70 years with lumbar spinal stenosis.
- Neurological claudication distance less than 500m.

b) Exclusion Criteria

- Post traumatic spinal stenosis.
- Lumbar spinal stenosis due to tumors and infections.
- Patients not willing to participate in the study.

Patients were managed with three different surgical techniques according to preformulated indications. Laminectomy with Discectomy, Laminectomy with Discectomy with Posterior spinal fusion or Laminectomy with Discectomy with Posterior Instrumentation, Inter body cage. All the patients were followed for one year at fixed interval (3 months, 6months and 1 year) to study the outcome.

Pre and post operative assessment of the patients was done according to JOA evaluation system for low back pain. The JOA score was determined by direct questions to evaluate symptoms, signs, and restriction of daily living activities. The recovery rate was calculated as reported by Hirabayashi et al. [8]

Recovery rate (%) = (Postoperative score - Preoperative score) / (29 - Preoperative score) × 100.

Rate of Recovery was classified as: Excellent, > 90 %, good, 75-89 %; fair, 50-74 %, and poor, below 49 %.

III. Results

Table 1: Distribution of Patients According to Various Characteristics

Variable		No. (n = 20)	%
Age	≤ 50 yrs	4	20
	51 - 55 yrs	3	15
	56 - 60 yrs	6	30
	61 - 65 yrs	4	20
	66 - 70 yrs	3	15
Sex	Female	7	35
	Male	13	65
Claudication Distance	< 100 m	6	30
	101 - 200m	7	35
	201 - 300m	4	20
	301 - 400m	3	15
Procedure	Laminectomy with Discectomy	6	30
	Laminectomy with Discectomy with Posterior Spinal Fusion	12	60
	Laminectomy with Discectomy with Posterior Instrumentation with Interbody Cage Fixation	2	10

It was observed that majority of the patients were more than 55 years old (65%). And it has male predominance (65%). 30% patients were having Claudication distance less than 100 meters.

Laminectomy with Discectomy with Posterior spinal fusion was performed in 60% cases and it was followed by Laminectomy with Discectomy in 30% patients.

Table 2: Distribution of Patients According to JOA Scores

Score	Pre Operative	Post Operative		
		3 Month	6 Month	1 Year
10-14	1 (5%)	1 (5%)	0	0
15-19	10 (50%)	4 (20%)	1 (5%)	0
20-24	9 (45%)	14 (70%)	9 (45%)	3 (15%)
25-29	0	1 (5%)	10 (50%)	17 (85%)

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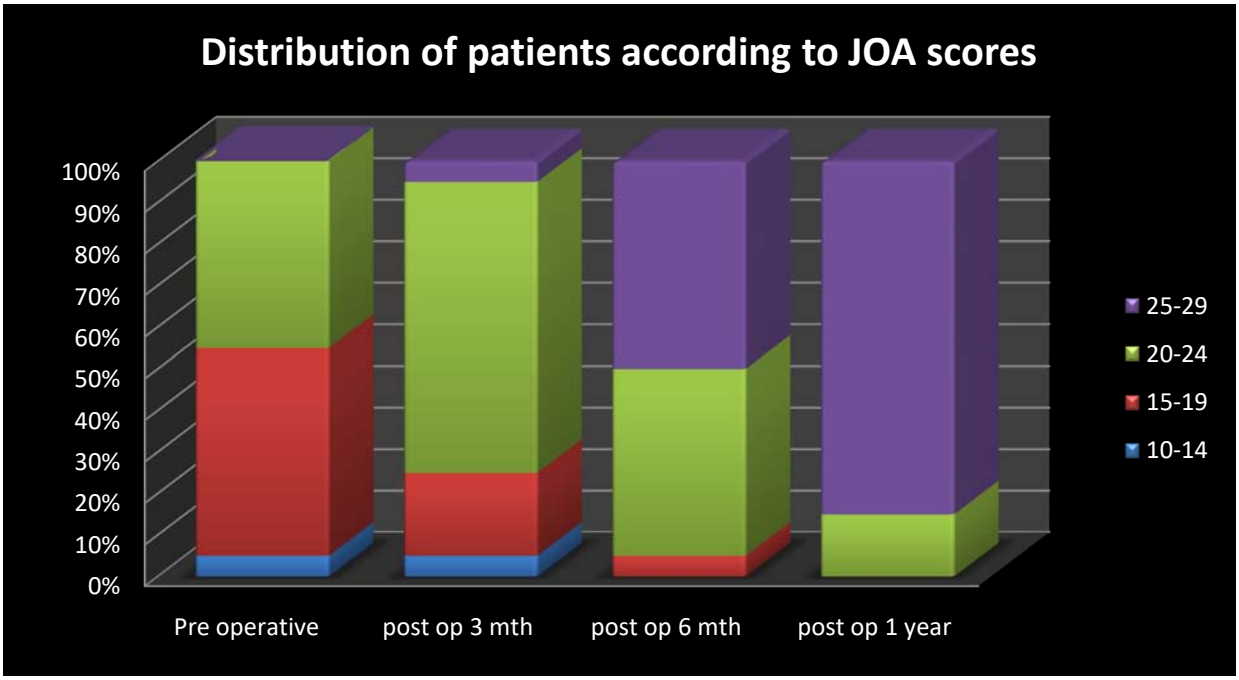


Chart 1: Distribution of Patients According to JOA Scores

It was seen that majority of the patients (55%) in the study were having JOA scores less than 19 preoperatively. On post operative 3rd month 75% patients were having scores 20 and above whereas on post operative 6th month proportion was increased to 95%. On post operative one year no patient was having scores less than 20.

Table 3: Outcome According to Recovery Rate

Outcome	No. (n = 20)	%
Excellent	2	10
Good	10	50
Fair	7	35
Poor	1	5

Outcome of the surgical procedure was calculated by using the recovery rate. It was observed that 50% patients were having good functional outcome whereas 10% were having excellent outcome. Fair outcome was observed in 35% patients and poor in 5% patients.

IV. Discussion

The present study was undertaken to study the functional outcome of surgical management of lumbar spinal stenosis. Japanese orthopedic association score (JOA) was used to measure the functional outcome. It was observed that majority of the patients in the study were more than 55 years old (65%).

It was also observed that 30% patients were having Claudication distance less than 100 meters. Majority of cases came with complaints of low backache and radicular pain. The duration of symptoms varied from 1 month to 5 years. Most of patients had a positive SLRT along with neurological deficit & paraspinal spasm. Laminectomy with Discectomy with Posterior spinal fusion was the most commonly (60%) performed procedure.

55% patients in the study were having JOA scores less than 19 preoperatively. Improvement in the JOA score was observed postoperatively. And after one year of surgery no patient was having scores less than 20.

The formula of recovery rate was used to calculate the functional outcome of the surgery[9-12]. 50% of patients were having good functional outcome and 10% were having excellent outcome. Fair outcome was observed in 35% patients and poor in 5% patients.

Ganz et al[13] (1990) reported almost similar result showing 86% good outcome in their series of 33 patients treated by de-compressive surgery. Weinstein et al[14] (2010) showed that patients with degenerative spondylolisthesis and spinal stenosis treated surgically showed substantially greater improvement in pain and function during a period of 2 years than those treated non-surgically.

Weber et al[11] and Spengler DM et al[15] also reported higher proportion of good and excellent outcome in surgically treated groups.

Thus we could say that operative treatment in patients of lumbar spinal stenosis yields excellent long term functional results as observed on the basis of JOA scoring system provided that patients are properly selected and de-compressive surgery is performed simultaneously addressing the associated instability orlisthesis. Majority of the activities of daily living which were assessed using JOA score showed significant improvement.

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V. Conclusion

On the basis of these results and discussion we could conclude that Operative treatment in patients of lumbar spinal stenosis yields good to excellent results as observed on the basis of JOA scoring system.

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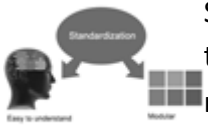


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Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.



Format Structure

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.

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

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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.

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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.

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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.

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



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Mistakes to avoid:

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- 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:

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- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
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Approach:

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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.

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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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