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Editorial

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Clinical Prediction Rules and Clinical Decision Rules: Need for Bridging the Knowledge Translation Gap from Evidence into Orthopaedic Clinical Practice

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Abstract

Clinical prediction rules (CPR) or clinical decision rules (CDR) facilitate clinical decision-making by utilizing a combination of presenting symptoms and signs in a person with orthopaedic disorder to predict his / her diagnosis, therapy responses and outcomes. This editorial presented the importance of CPR / CDRs in Evidence-based Orthopaedic clinical practice, and there is need to explore CPR / CDRs in disease-specific, procedure-specific and population-specific domains in the future.

Keywords: Knowledge Translation; Evidence Based Practice; Orthopaedic Decision Making; Clinical Orthopaedics.

Clinical prediction rules (CPR) or clinical decision rules (CDR) facilitate clinical decision-making by utilizing a combination of presenting symptoms and signs in a person with orthopaedic disorder to predict his / her diagnosis, therapy responses and outcomes.[1] They are clinical decision support tools that synthesize evidence for use in everyday practice which need to follow specific guidelines prior to development: identifying the need for the rule, carefully defining the outcome variable, identifying and selecting the possible predictor variables, and guidelines for initial testing.[2] A knowledge-based data analytical approach for creating CPR / CDRs from documented medical records should integrate medical knowledge into statistical analysis.[3]

CPR / CDRs reduce the uncertainty inherent in orthopaedic clinical practice by defining how to use clinical findings to make predictions, and they can help physicians identify patients who require diagnostic tests, treatment, or hospitalization.[4] CPR / CDRs should describe the mathematical technique used to develop the rule, be clinically sensible, define outcome and predictive variables, assess in a blinded method, with prospective validation, reproducibility testing for predictive variables, and, measure the effect of the rule on clinical use.[5]

CPR / CDRs are valuable tools to Evidence-based practice by helping organize research evidence into standardized patient assessments and treatments, thereby increasing the probability of attaining the desired outcome and reducing uncertainty in practice.[6] Evaluating CPR / CDRs should include whether CPR / CDRscan do so in a variety of settings (especially in settings similar to one's own), and that using it will likely result in improved patient outcomes at no additional cost (or conversely, that it will lower costs with no adverse effect on clinical outcomes).[7] However, organizational factors, cognitive factors, social factors, and motivational factors influence knowledge translation (KT) of evidence-based clinical algorithms derived from CPR / CDRs.[8]

Whilst use of CPR / CDRs for translating clinical research into clinical practice should follow the steps for evaluation listed by Reilly and Evans;[9] "standards of evidence for developing and evaluating prediction

rules; important differences between prediction rules and decision rules; how to assess the potential clinical impact of a prediction rule before translating it into a decision rule; methodologic issues critical to successful impact analysis, including defining outcome measures and estimating sample size; the importance of close collaboration between clinical investigators and practicing clinicians before, during, and after impact analysis; and the need to measure both efficacy and effectiveness when analyzing a decision rule's clinical impact."

Ingui and Rogers[10] described the MEDLINE search strategy to retrieve CPR / CDRs as follows;"the filter "predict$ OR clinical$ OR outcome$ OR risk$" retrieved 98 percent of clinical prediction rules. Four filters, such as "predict$ OR validat$ OR rule$ OR predictive value of tests," had both sensitivity and specificity above 90 percent. The top-performing filter for positive predictive value and positive likelihood ratio in the validation set was "predict$.ti. AND rule$."

Critical appraisal of CPR / CDRs for their relevance, quality and applicability should be performed in terms of internal and external validity to optimize treatment selection for musculoskeletal conditions.[11]McGinnet al[12]considered"CDRs that have been validated in a new clinical setting to be level 1 CDRs and most appropriate for implementation. Level 1 CDRs have the potential to inform clinical judgment, to change clinical behavior, and to reduce unnecessary costs, while maintaining quality of care and patient satisfaction." Cook et al developed QUADCPR- a quality checklist for prescriptive CPR/CDRs using Delphi methods.[13]Knowing how to use CPR/CDRs is essential prior to applying their findings into routine practice of care.[14]

Ebell[15] listed the desirable qualities of as follows; "valid (make accurate predictions of risk), relevant (have been shown to improve patient-oriented outcomes), are easy to use at the point of care, are acceptable (with good face validity and transparency of recommendations), and are situated in the clinical context."

McGinn et al[16]presented"3 teaching tips aimed at helping clinical learners use clinical prediction rules and to more accurately assess pretest probability in every day practice: The first tip is designed to demonstrate variability in physician estimation of pretest probability. The second tip demonstrates how the estimate of pretest probability influences the interpretation of diagnostic tests and patient management. The third tip exposes learners to various examples and different types of Clinical Prediction Rules (CPR) and how to apply them in practice."

Evaluation of routine usage of CPR / CDRs is essential to identify facilitators and barriers for the knowledge translation process in EBP,[17] which again undergo a thorough ongoing process of validation, updating and impact evaluation.[18]Impact analysis studies remain the most efficient way of assessing whether incorporating CPRs into a decision making process improves patient care.[19] Acceptability of CPR / CDRs should also be explored cross-nationally using instruments such as Ottawa acceptability of decision rules instrument (OADRI).[20]

This editorial presented the importance of CPR / CDRs in Evidence-based Orthopaedic clinical practice, and there is need to explore CPR / CDRs in disease-specific, procedure-specific and population-specific domains in the future.

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Editorial

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Simulator Based Skill Training – Is It Worth?

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Use of simulators is quite common in aviation industry, pilots would not hold down a job without proof of simulation training. Similarly in medical field, surgical simulation is increasing in western world as opportunities for learning through work on "real" patients have decreased [(1)]. Such a scenario does not exists in India.In this new model of surgical skill training, basic surgical skills are learnt and practiced on models and simulators with the aim of better preparedness for operating room.

Surgical procedures especially those with complex instrumentation have a steep learning curve, so it takes a number of repetitions before trainees have the manual dexterity to do it right. Simulators allow trainees to practice over and over again without any harm to the patient. Mistakes on the simulator are harmless and are rectified by repeated deliberate practice.Simulation for surgery has the potential to afford the opportunity for the trainee to obtain and refine surgical skills in an "inconsequential" manner (i.e., without morbidity to the patient).

It has been demonstrated that transfer validity (transfer of training) of residents trained on a arthroscopic knee simulator showed a greater skill level in the operating room compared with the control group[(2)].It has been found that the simulator is able to show statistically significant differences in skill level between first year postgraduate residents and both final year postgraduate residents and community-based orthopedic surgeons, but not between the latter two groups. Hence, it can be inferred that junior residents' surgical skills would be enhanced by training on an arthroscopic simulator before beginning their arthroscopic operating room experience. Higher levels of surgeon experience resulted in improved efficiency when performing diagnostic knee arthroscopy on the simulator [(3)].

But, surgical simulation, by itself, will not ensure that the trainee will become a more skilled surgeon. A carefully constructed and validated curriculum must form the foundation and precede the employment of the simulator. The specific tasks on which a trainee has to be trained must be identified and then parametersshould be created for that task which should be clear, objective, measurable and achievable. The trainee must know not only how to execute the proper technique, but also the potential errors to be avoided. Once the parameters for a specific skill or a particular procedure are validated, simulations / simulators can be designed specifically to mimic that experience and train those skills.

The use of simulation to demonstrate surgical skills may become a tool for pass-fail certification or maintenance of certification for practicing orthopedic surgeons in the future. Training in arthroscopy is one such area where simulator teaching is in practice in few institutions in developed countries.

Surgical simulation advantages include (a) Providing the trainee with "synthetic experience" with the chance to acquire surgical or procedural skills, (b) Permitting the trainee to enact procedural / technique errors in an "inconsequential" manner (no patient morbidity) and to learn from those errors to improve their technique, (c) Enabling the trainee to engage in repetitive practice and (d) Providing the feedback to trainee, which helps in documenting the progress toward a predetermined benchmark.

Surgical simulation has some distinct disadvantages as well. Firstly, the simulator, by itself without a pre-existing validated curriculum, may be ineffective in improving the skill sets necessary to

train essential surgical techniques. Secondly practice on the simulator without specific, defined performance goals has the potential to ingrain poor habits / skills. Thirdly, the high cost of the simulators remain the biggest inhibiting factor especially in country like India.

In my opinion although there might be many advantages of simulator training might be but simulation does not become a substitute for the apprenticeship model. The use of simulators does not replace the place of actual one-on-one interaction with faculty mentors and surgeons who help and train the residents on using the equipment and interacting in surgery. Residency should always be an apprenticeship model where faculty takes pride in teaching a junior resident on improving their skills.

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Original Article

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Study of Management of Subtrochanteric Fractures of the Femur in Adults Using Long Proximal Femoral Nail

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Abstract

Background: Numerous variations of Intramedullary nails have been devised to achieve a stable fixation and early mobilization of subtrochanteric fracture, among which is the proximal femoral nail (PFN). We reported here the results of a prospective study carried out Institute on 30 consecutive patients who had suffered subtrochanteric fracture between from January 2013 – January 2015 and were subsequently treated with a PFN. *Materials & Methods:* The inclusion criteria being acute and/or pathological subtrochanteric femur fractures aged above 18 Years. The patients were maintained on traction preoperatively in cases whose surgical intervention was delayed for more than two days. All operations were performed under spinal/epidural anesthesia. Postoperative mobilization was started once the patient's conditions were favorable. Weight bearing was determined by the fracture pattern. *Results:* We came across 18 male patients and 12 female patients. 60% of the cases associated with RTA and 40% were associated with history of fall. The entire 30 patients with traumatic sub trochanteric fractures healed uneventfully except 2 cases of delayed union. No complication such as cut out or breakage of implant or peri implant fracture were encountered. *Conclusions:* Long proximal femoral nail is the most reliable implant for sub trochanteric fractures, leading to high rate of union. The high advantages include minimal exposure, better stability and early mobilization with biological and biomechanical advantages.

Keywords: Fracture; Hip; Sub-Trochantric; PFN.

Introduction

Sub trochanteric fractures occur as extension of intertrochanteric fractures or as independent entities. A sub trochanteric fracture femur is a fracture between the lesser trochanter and a point 5cm distal to lesser trochanter[1] . Subtrochanteric fractures account for approximately 10%- 30% of all hip fractures and these fractures have a bimodal distribution. The mechanism of sub trochanteric fracture is direct trauma, and significant forces are usually required. The sub trochanteric segment of femur is subject to high biomechanical stresses. The medial and postero-medial cortices are sites of high compressive forces whereas lateral cortex experiences high tensile forces.

The sub trochanteric area of femur is mainly composed of cortical bone with less vascularity in this region and potential for healing is diminished as compared with intertrochanteric fracture. These fracture have a characteristics deformity with deforming forces in proximal fragment include abduction and flexion and the distal fragment is pulled proximally and in to varus by adductors. Although these fractures are most difficult to manage in the femur ,our improve understanding of complex biology and biomechanics of trochanteric region as well as rapid development of orthopaedic philosophy

and implants has lead to consensus on the treatment of sub trochanteric fractures[2]. However the appropriate implant for internal fixation of sub trochanteric fractures remain debatable and a multitude of different intra – and extra medullary devices for their surgical fixation has been advocated.[3,4,5,6,7]

The sub trochanteric region of the femur is subjected to many stresses resulting from bending movements and compressive forces, thus leading to non union, malunion and non-union of fractures and mechanical failure of the implants[8-9]. The objective of our study was to evaluate the clinical and radiological outcomes of traumatic sub trochanteric fracture femur fixed with long proximal femoral nail with emphasis on our experiences with surgical techniques, surgical time, postoperative rehabilitation, open reduction, hospital stay and list their various complication.

Material & Methods

The study will be carried out in department of orthopaedic surgery SAIMS Indore, with a series of 30 consecutive patients with sub trochanteric fracture, underwent intra medullary fixation specifically with long proximal femoral nail during a 2 year period from January 2013 – January 2015. The inclusion criteria include acute sub trochanteric femur fracture, patient age > 18 year and pathological sub trochanteric femur fractures. Patient with open fractures, cases infected in preoperative period and fractures age below then 18 year were excluded from the study. This is a prospective study and all fractures will be classified according to Seinsheimers classification. The patients were maintained in traction preoperatively in cases whose surgical intervention is delayed for more then two days. All operation was performed under spinal or general anaesthesia.

For surgery the patient was positioned supine on fracture table and fracture was reduced by longitudinal traction with limb placed in neutral or slight adduction to facilitate nail insertion with standard lateral incision which was made from tip of greater trochanter extending 4-6 cm proximally. Open reduction was used by extending the incision wherever necessary. Postoperatively , the patient were encouraged to do active flexion and extension of hip and knee and was started ambulation with walker without weight bearing on 3rd day and partial weight bearing was started at 6 weeks and full weight bearing was begun 8-12 weeks. Postoperatively all patient will be follow up at 6 weeks, 12 weeks, 6 months and 1year for clinical and radiological outcome.

Result

A total of 31 patients met the selection criteria, treated specifically using long PFN. One patient who had been was lost to follow up, so finally we included 30 patients with sub trochanteric fracture treated with long PFN. Highest number of patient were in the age group of 50-70 followed by 18-30, 30-50, and >70 age with number of patient being 15, 7, 5, 3 respectively. The male represented 18 cases out of study whereas female were 12 in number. 60% of the cases associated with RTA and 40% were associated with history of fall. The mean operative time in our study was 60-100 minutes in an average. All patients underwent surgery with in 6 days of admission except 1 due to pre-existing cardiac and neurological diseases was treated by medical team prior to surgical procedure.

During intervention open reduction and fixation with circlage wiring through an incision was made in 10 cases and their average operative time was 69 minutes. Only 10 cases needed size 11 LONG PFN and rest has operated for size 10 nail. In contrast of these only 2 cases (0.6%) of implant dissembled was noted due to strong flexion pull of muscles at proximal fragment, this will lead to delayed union eventually, but did not associated with relevant shortening or rotational mal alignment. The average time to radiological union was 5 months and at the end of 6 month all except 2 patients could mobilize independently. Two patients were using walker to mobilize up to 9 months postoperatively. Walking and standing ability was completely restored in each case at follow up examination of 6 months postoperatively and there is not any complaining of limping.

The entire 30 patient with traumatic sub trochanteric fractures healed uneventfully except 2 cases of delayed union. No interventions were required in Delayed union case only wt bearing was delayed in these cases. No complication such as cut out or breakage of implant or peri implant fracture were encountered. Removal of distal locking bolt for dynamization of nail to improve bone union was not made as it was not necessary in any case.

Fig. 1: Case 1 Pre op

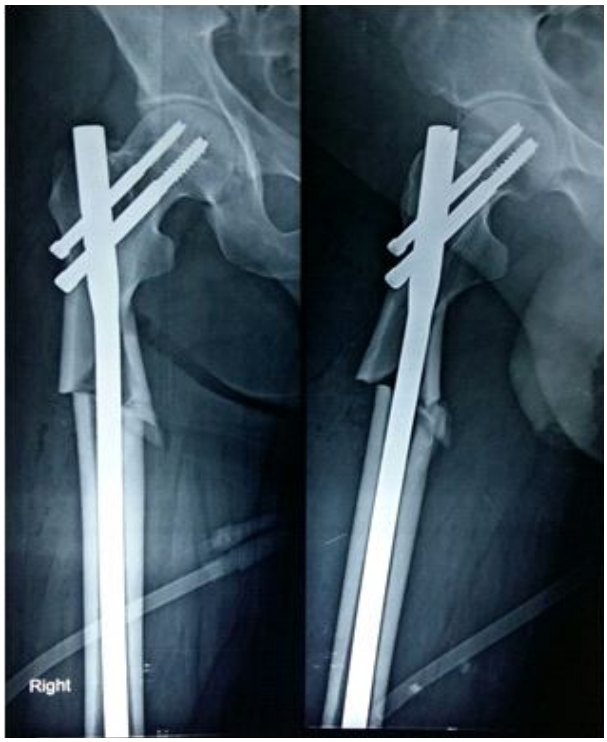

Fig. 2: Post op

Fig. 3: 1 month Post op

Fig. 4: Case 2 Pre op

Fig. 5: Post-op

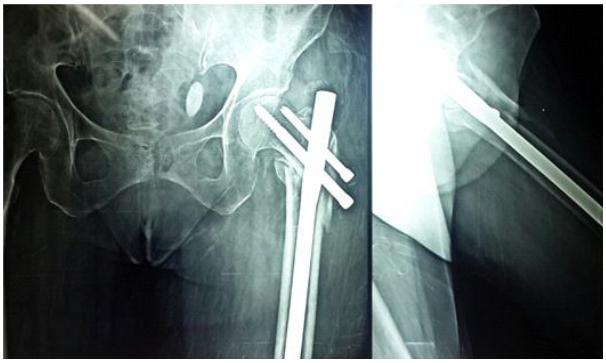

Fig. 6: 1 month Post op

Discussion

Sub trochantric fractures are usually the result of high energy trauma and often subjected to significant displacement and great difficulties in closed reduction through traction and these fractures are associated with high incidence of delayed union, malunion, and non union of fractures has left conservative treatment as advocated by DeLee et al [10]. Open reduction and internal fixation with plating has the disadvantages of extensive surgical exposure, soft tissue damage and excessive blood loss and there are high chances of fatigue and breakage of plate which are eccentrically placed in proximal fragment[3, 5,7,11]. MIPPO technique in sub trochanteric fracture has not been successful as a fracture of distal femur or proximal tibia. As great difficulties were often encountered during fracture reduction and plate pre-contouring open reduction is sometimes inevitable, thus making this technique not truly minimally invasive [12, 13, 14].

Allowing a minimally open approach intra medullary nailing is closely linked to "biological internal fixation", in addition to its mechanical benefits over plate fixation[15]. Initially in sub trochanteric fracture femur standard femoral nail was used , which not give much stability in proximal fragment and the entry point in standard femoral nail was in piriformis fossa so there is much more difficulty during passing guide wire and nail on the fracture table while the patient is in supine position. The recent development of reconstruction nail which change the direction of the proximal interlocking bolts has gradually expanded the indication of intra medullary fixation for sub trochanteric fractures[16].

From a mechanical point of view the use of long intra medullary nail in combination with proximal screw to be more appropriate treatment for sub trochanteric fracture of femur[17, 18]. The surgical technique for guide wire and nail insertion is much easier with this long proximal femoral nail because entry point is shifted laterally and the blood supply of the femoral head were preserved . closed reduction of the fracture preserve the fracture hematoma an essential element in consolidation process and intra medullary fixation allows the surgeon to minimize soft tissue dissection thereby reducing surgical trauma ,blood loss, infection and other wound complication . The current failure rates of most frequently used intra medullary nail vary from 4- 20%[19,20,21,22,23,24]. The most commonly described failure are due to cut out of the neck screw which has been reported between 0 and 10% [20] of cases followed by migration of distal screw fractures of the femoral shaft at the tip of implant , mal rotation ,and deep infection[20,23] . Besides a technical problem related to mismatch of the proximal end of some nails depending on the population has been reported[25].

In this study all 30 cases of traumatic sub trochanteric fracture healed uneventfully except 2 cases of delayed union .walking and squatting ability was completely restored in each case (included the patients with delayed union). No complication such as cut out or breakage of the implants or peri- implant fractures were encountered. Many authors believed that the long PFN must be distally interlocked in order to prevent rotational mal alignment of distal fragment and some of them even recommended that 2 bolts be necessary for distal interlocking[26, 27]. Because radiolucent drill is not available in most hospitals, distal locking is mainly through freehand technique and it will increase the operative time and increases the fluoroscopic exposure of surgeon. We did distal interlocking with 2 bolts in all type of Seinsheimer classification.

We also realise that the key for success of operation depend on correct determination of entry point which must be on top of greater trochanter in AP view and in line with the centre of femoral canal in LATERAL view. The abundant muscle around the sub trochanteric region usually cause significant displacement of the fracture fragments, leading to great difficulties in closed reduction under traction. Sometimes open reduction with small incision at the fracture site is inevitable. The fractures that needed open reduction were always those with long spiral fracture line. In our study we also found that lag screw of the LONG PFN should be placed in lower part of femoral neck close to femoral calcar with screw tip reaching the sub chondral bone 5 - 10 mm below the articular cartilage in AP view . In lateral view it should be placed in centre of femoral neck. There the lag screw will be definitely placed in the area of best bone quality .in addition, cut out is also related to the timing of weight bearing.

In our study we started partial weight bearing as soon as possible, to prevent other medical disorder and improve the compliance of the patient and early hospital discharge. In our prospective study we have some limitation that we have no control group or any other type of internal fixation method to serve as a comparison to the surgical technique being investigated. Secondary, we did not use an accepted outcome measure such as "Harris hip score" to presents our results. We have only two criteria of clinical and radiological assessment with no limp, which was crude method. But still in Asian population small changes in surgical technique and preoperative planning and rehabilitation protocol leads to favourable out come.

Conclusion

Long proximal femoral nail is the most reliable implant for sub trochanteric fractures, leading to high rate of union. The high advantages include minimal exposure, better stability and early mobilization with biological and biomechanical advantages, and it also required great patience and gradual learning in order to make this method truly minimally invasive.

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Original Article

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Comparative Study of Lumbar Laminectomy under General Anaesthesia compared with Spinal Anaesthesia

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Abstract

Introduction: Present study was planned to know the benefits of laminectomy done under spinal anaesthesia compared with general anaesthesia. *Study Design:* During 2010 to 2015 seventy patients were operated for lumbar laminectomy, 40 cases under spinal anesthesia and 30 under general anesthesia. All were operated by posterior midline approach in prone position. All were disc prolapse at L3-L4 and L4-L5 level and spinal canal stenosis. All patients had backache with neurological symptoms in lower limb. Age group is 35 yrs. to 60 yrs. Males were 46 and 24 females. Preoperative clinical examination, MRI and X ray were done before selecting patients for surgery. Proper prior operative consent for operative intervention was obtained. *Results:* 1. Overall study revealed that L3-L4, L4-L5 and L5-S1 disc were commonly responsible for pain and neurological deficit. 2. Cases operated under Spinal anesthesia for lumbar disc had better recovery, less bleeding, less complications and early ambulation was possible. 3. General anesthesia has more complications and cardiorespiratory complications. *Conclusion:* Laminectomy done under spinal anesthesia has better outcome. Surgeon, anesthetist and patients have less problems intra and postoperative complications.

Keywords: S.A.-Spinal Anesthesia; G.A.-General Anesthesia.

Introduction

Surgery on the lower thoracic and lumbar spine can be safely performed under general or regional anesthesia. Patient satisfaction and the ability to carry out prolonged operations in prone position without airway compromise are advantages of using general anesthesia (GA).[1,2] Alternatively, the important advantages of regional anesthesia are the decrease in intraoperative blood loss and consequently improving operating conditions,[3] the decrease in perioperative cardiac ischemic incidents, postoperative hypoxic episodes, arterial and venous thrombosis, and to provide proper postoperative pain control.[4–7] Additionally, in order to prevent brachial plexus injury and pressure necrosis of face, it is better if patients can position themselves while they are awake. This is possible only with spinal anesthesia (SA).

As Scott et al[8] showed, pulmonary complications were more common in patients who underwent GA compared with regional anesthesia. Two retrospective studies have shown that SA resulted in better outcome compared with GA in patients who underwent surgeries on lumbar spine.[9,10]

An acceptable anesthetic technique must have characteristics such as rapid onset and reversal of effects. Also, it must maintain stable hemodynamics during operation without need to increase blood transfusion. Lastly, an excellent anesthetic must decrease recovery room stay while reduce postoperative pain, nausea, vomiting, and requirement for additional analgesics. As our search in medical literature showed, there are controversies

whether SA or GA offers these advantages for lumbar disc surgery. Sadrolsadat et al[11] showed that in contrast to the previous studies that revealed SA was better than GA for patients undergoing lower thoracic and lumbar spine surgery SA had no advantages over GA. They also showed that SA accompanied with more adverse effects compared with GA. They emphasized that further study must be performed before final conclusion is elucidated.

In the clinical experience, it seems to the authors that patients who undergo lumbar spine surgery with SA have more satisfaction with lower adverse effect compared with those with GA. This is in accordance with the most previous studies but is opposite to Sadrolsadat et al study. For more clarification of this important topic, we designed to run the present study to evaluate both intraoperative and postoperative outcomes after SA or GA techniques, when employed in patients undergoing lumbar spine surgery.

Method

Seventy patients aged 35-60 years old who were scheduled for discectomy, laminectomy. Patients with history of seizure or intracranial hypertension, contraindication for spinal anesthesia (such as patients refusal, coagulopathy, infection at site of needling, hypovolemia), severe spinal stenosis, a near complete or total block, inadvertent production of high spinal, drug or alcohol abuse were excluded. If patients had any changes in surgical technique or massive bleeding during operation which needed blood transfusion, they were also excluded from the study. Eligible candidates were given written informed consent. The study was performed at PDVVPF'S Medical college and Hospital from 2010 to 2015. The sample size was estimated based on a power calculation which showed that at least 30 patients per group were necessary to achieve 80% power to detect a 20% difference between two groups in the VAS scoring with á equal to 0.05.

All surgeries were carried out by the same surgeon. Patients were randomly allocated into GA or SA groups with 30 and 40 patients in each group.

No premedication was given to the patients. Subsequently, the patients were properly placed in a prone position, arms resting on the arm boards while they were flexed 90 degrees at elbow. For prevention of pressure on nose and globe of the eyes, the face was placed on a smooth brace.

The heart rate, systolic, diastolic, mean arterial blood pressure and oxygen saturation were monitored every 15 minutes throughout the surgery using ECG, noninvasive blood pressure monitoring and pulse oximetry. After termination of operation, the anesthetic drugs were discontinued after patients received 100% oxygen. Subsequently, neuromuscular blockade was reversed by using Neostigmine 0.04 mg / kg and Atropine 0.02mg / kg. The trachea was extubated and patients transferred to the post-anesthesia care unit (PACU) if patients had spontaneous respiration, pulse oximeter oxygen saturation more than 95%, end-tidal carbon dioxide 35-40 mmHg, respiratory rate less than 30 per minutes, and tidal volume more than 5 ml per kilogram.

In SA group, the block was done with 3.0 – 3.2 ml 0.5% Bupivacaine in an 8.5. Thereafter, the patients were placed in sitting position and preparation and draping were done. Spinal anesthesia was performed using a 25-gauge Quincke spinal needle at either the L4 or L5 interspace after local infiltration of 2-3 ml of 2% Lidocaine. After observing spinal fluid 3cc Bupivacaine is added to Dexmeditomedine in a dose of 10 micro-grams and was administered into intrathecal space and patients were placed in supine position. Five to ten minutes after establishment of spinal level of block (which usually occurred between T-6 and T-10), the patients were placed into prone position. Oxygen at 2L / min via nasal cannula was administered afterwards.

Fig. 1: Spinal Anesthesia

Throughout the surgery, if the patients had bradycardia (heart rate less than 60 per minutes) or hypotension (systolic blood pressure less than 90 mmHg), 0.5 mg Atropine or 5 mg Ephedrine was administered. Throughout the surgery, sedation of patients was done by a Propofol infusion of 25-50 µg / kg / min IV. At the end of surgery, the Propofol was discontinued and the patient was turned from

the prone position to supine and transferred to the PACU.

The patients and surgeon satisfaction was also evaluated as a dichotomized factor (Yes or No). Duration of surgery (the time from beginning surgery to the closure of wound by the last suture) and duration of recovery stay (the time from arrival to the PACU to discharge from it) were recorded. If patients were awake and had no pain, nausea, vomiting, or hemodynamic instability, they were discharged from PACU in Group GA. In Group SA, when patients had no pain, nausea, vomiting, and at least two segment regression of spinal block, they were discharged from the PACU.

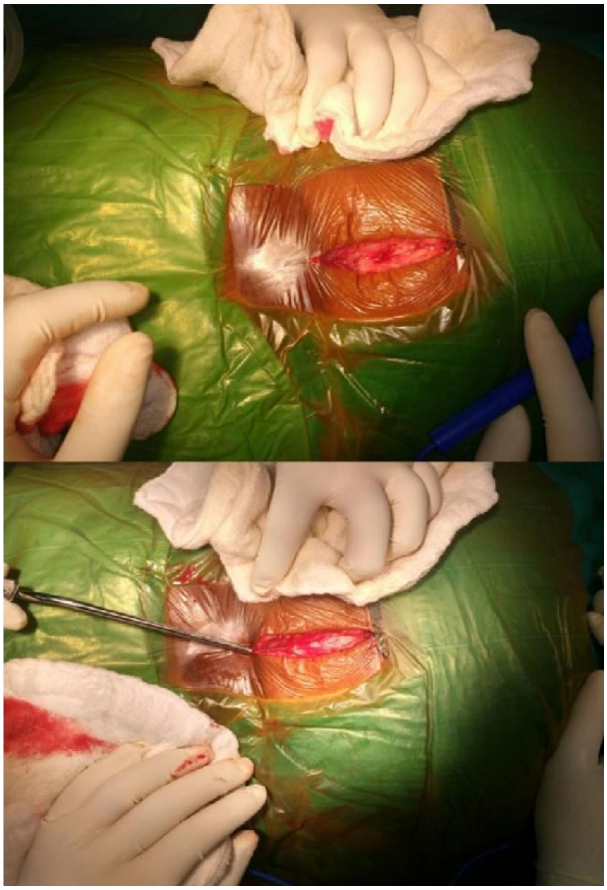

Fig. 2, 3: Intra-operative pictures: Incision

Data is presented as mean ± SD or number (percent), Age, weight, height, maximum blood pressure and heart rate changes, duration of surgery, duration of recovery stay and blood loss were compared between two groups using Student's t-test. Sex, ASA physical status, patients and surgeon satisfaction, postoperative analgesic use, and complication rates were assessed by Pearson chi-square test or Fisher's exact test if needed. P-value < 0.05 was considered statistically significant. All statistical analyses were done using SPSS ver.16.0.

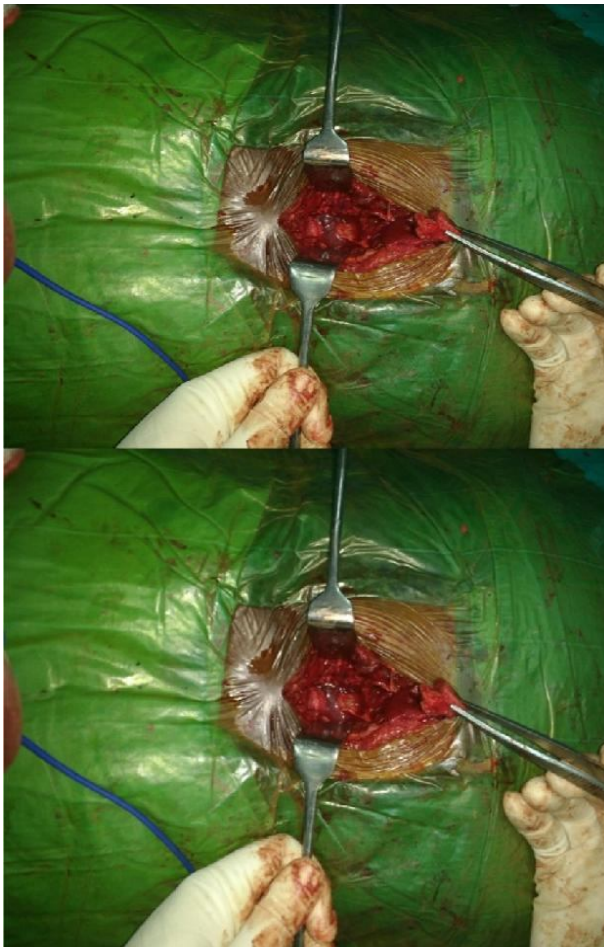

Fig. 4, 5: Intra-operative images after removal of Lamina

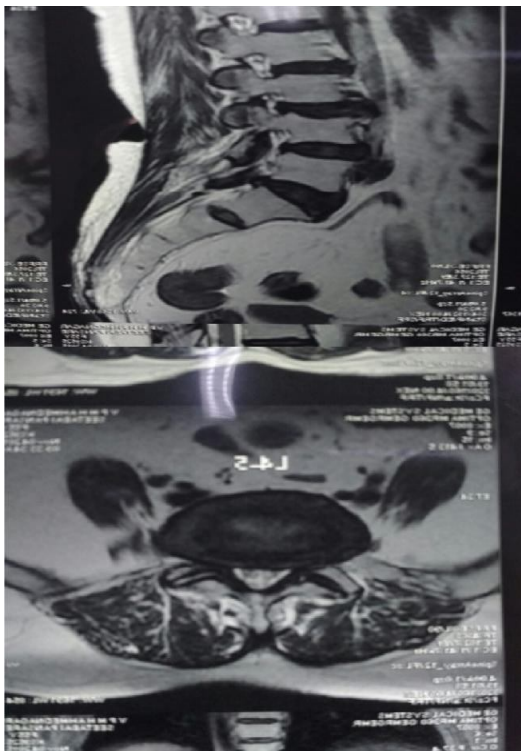

Fig. 6, 7: MRI images of PIVD L4-L5, L5-S1

Results

There was no significant difference between two groups with respect to demographic characteristics, duration of surgery and PACU stay. Intra-operative maximum mean arterial blood pressure and heart rate changes were significantly less in SA compared with GA ($p < 0.05$).

Blood loss was significantly less in SA group compared with GA group ($p < 0.05$). Surgeon and patients satisfaction were significantly more in SA compared with GA ($p < 0.05$).

Postoperative analgesic use and total Meperidine use was significantly less in SA group compared to GA group ($p < 0.05$). The incidence of postoperative nausea was not significantly different in two groups. There were no patients with hypotension or bradycardia in SA or GA groups.

Discussion

Spinal, epidural or general anesthesia have been performed for lower spine surgery, but limited randomized controlled prospective investigations have been carried out to establish whether one of these procedures is better in decreasing peri-operative complications.

McLain et al[12] in a case-controlled study in 400 patients who underwent either spinal anesthesia or general anesthesia for performing lumbar decompression, showed that SA was as effective as GA. They concluded that SA caused shorter anesthesia duration, decreased incidence of nausea and analgesic needs, and accompanied with fewer adverse effects. The findings of McLain et al study were in contrast with Sadrolsadat et al[11] study that showed SA had no advantages over GA. Furthermore, they concluded that GA can decrease adverse effects accompanied with technique of anesthesia. They requested further clinical trial studies to verify their results.

In retrospective chart review, Tetzlaff et al[13] investigated the outcomes of a large series of elective lumbar spine surgical procedures which performed under SA or GA. They concluded that SA can be considered as an effective alternative to GA for lumbar spine surgery as it had lower incidence of minor complications. Their study was retrospective and they emphasized doing a prospective randomized clinical trial study for documentation of their results.

The present study showed that SA is better compared to GA. SA diminished blood loss, maximum blood pressure and heart rate changes, and postoperative analgesic use. In addition, surgeon and patients satisfaction was significantly more in SA. All procedures were performed with the same surgeon and the anesthesia was constantly performed with meticulous obedience to the practice and consequently confounding variables were avoided.

As previous studies showed, SA reduced blood loss for lower limb orthopedic and vascular surgeries compared to GA.[14–17] Lumbar spine surgery under epidural anesthesia was associated with decreased blood loss compared with general anesthesia.[18] The results of our study confirm these conclusions. SA presumably decreases blood loss by two mechanisms. One mechanism is vasodilatation and hypotension caused by sympathetic blockade.[19] Patients under SA have spontaneous ventilation which causes lower intra-thoracic pressure and consequently less distension of epidural veins. This is another and more important mechanism of decreasing bleeding after SA.[19] This finding that maximum intraoperative mean arterial blood pressure and heart rate changes over the basal value were significantly less in Group SA is not unexpected, because SA prevents the increase in stress hormones better than GA.[20–25]

SA improved postoperative conditions of patients due to decreasing pain and need to give analgesia. Hassi et al[10] showed that patient satisfaction was high with a low level of complications in SA. Nevertheless, their study was retrospective and did not compare it with the other anesthetic techniques. They, nonetheless, emphasize a general patient satisfaction with SA that was also described in our study.

Two different mechanisms can explain decreasing postoperative analgesic use in the SA. One mechanism is the preemptive effect of SA that decreases the pain scores by preventing afferent nociceptive sensitization pathway.[18] Lower analgesic requirement after operation pointed out such an effect. The second mechanism is probably existence of some residual sensory blockade in SA group. This is due to lagging of sensory recovery.

Conclusion

In our study of operative intervention done for lumbar disc and spinal canal stenosis, it was concluded that:

1. We can give prone position easily during spinal anesthesia compared to general anesthesia.
2. Bleeding during spinal anesthesia was less than general anesthesia.
3. Operative field was more clear as bleeding was less.
4. Surgery time was less as compared to G.A. in spinally operated patient.
5. Post-operative hematoma and infection incidence was reduced in spinal anesthesia.
6. There were no major mishaps in S.A.
7. Surgeon and patient were more comfortable during intra-operative and post-operative recovery

Authors' Contributions

DBN has planned the study and finalized it; VG has planned the study and finalized it too; DBN did the statistical analysis and prepared the first version of manuscript and revised final version to publish. All authors read and approved the final manuscript.

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Conflict of Interests

Authors have no conflict of interests.

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Review Article

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Bone Mineral Density and Grip Strength: Association Versus Relationship and Site-Specific or Systemic?

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Abstract

Bone mineral density (BMD) and grip strength (GS) are two commonly employed clinical orthopedic examination procedures, where the former is laboratory-based and the latter clinically performed. The aim of this review article was to update the evidence for inter-relationship between BMD and GS through a preliminary search of PubMed.Of the total 11 studies, there were six population-specific studies on normal healthy population (adolescents, adults, men, women, older adults, older women), two studies on healthy athletes (young athletes, combat athletes), and three studies on postmenopausal women (Japanese, Thai, Turkish). Whilst the question of site-specific or systemic still remains unanswered, the answer was reported to be influenced by many other variables such as gender, body weight, hand dominance and menopausal status. Albeit, there is a positive association and strong correlation existing between grip strength and bone mineral density, with grip strength being an independent predictor of BMD in some population. There is need for controlled clinical trials on interventions aimed at improving grip strength and their effects on BMD in osteoporotic men and women.

Keywords: Muscle-Bone Inter-Relationship; Starling's Law; Orthopedic Examination; Osteoporosis.

Bone mineral density (BMD) and grip strength (GS) are two commonly employed clinical orthopedic examination procedures, where the former is laboratory-based and the latter clinically performed. The aim of this review article was to update the evidence for inter-relationship between BMD and GS through a preliminary search of PubMed.

Healthy Adolescents

Chan et al (2008) assessed relationship between grip strength, bone mineral density (BMD) and bone mineral content (BMC) in 169 boys and 173 girls and found that grip strength was correlated well with bone mass at hip, spine and whole body for both sexes. Grip strength was an independent predictor of bone mass, except hip BMD in boys and whole body BMD in girls.The relationship between muscle strength and bone mass was thus found to be systemic.

Healthy Adults

Kaya et al (2005) assessed the site-specific relationship of hand bone mineral density (BMD) with hand size, pinch and grip strength in healthy adults comprising of 106 women and 37 men. Whilst there was no correlation found between hand BMD and grip, pinch strength or hand size in

premenopausal women, a significant correlation was found between hand BMD and grip strength was found in men. Their findings suggested a gender-specific interaction on the relationship.

Healthy Men

Aydinet al (2006) studied 234 male subjects and investigated the predictive role of grip strength on bone mineral density (BMD) of lumbar spine, femoral neck, proximal radius-ulna (PRU) and distal radius-ulna (DRU) in males.Grip strength of the same side was the best predictor of the BMD of the dominant and non-dominant PRU with a ratio of 8.5 and 10.2%, respectively, whereas grip strength of the same side, age and weight were the best predictors of the BMD of the dominant and non-dominant DRU with a ratio of 25 and 24.6%, respectively. Their findings suggested a site specific rather than systemic BMD.

Healthy Women

Ozgocmenet al (2000) studied 29 healthy housewives (12 premenopausal and 17 postmenopausal) and determined site-specific relationship between grip strength and hand bone mineral density (BMD) and found that hand BMD moderately correlated with grip strength in postmenopausal women, but not in premenopausal women.

Older Adults

Foley et al (1999) critically reviewed previously published studies on relationship between grip strength and BMD of proximal femur in older adults to report the challenges in appropriateness of research methods. They found that failure to control for the concomitant influence of body weight on both BMD and muscle strength was present in most of the studies; and absence of allometric scaling in analyses for the relationship between a physiological variable and a body dimension variable which can be nonlinearly and simultaneously influenced by other body dimension variables were not considered in the analysis and therefore are statistically uncontrolled in the previous studies.

Older Women

Kritz-Silverstein and Barrett-Connor (1994) studied 649 postmenopausal elderly womenand examined the association of grip strength with bone density at distant sites, such as the spine and hip, as well as at the wrist and radius. Their study findings concluded that only exercising women had significant associations of grip strength with bone mineral density, and overall, grip strength was an independent indicator of general bone density.

Young Athletes

Tsuji et al (1995) studied 10 male college wrestlers, 16 female college basketball players, and 12 female college tennis players to evaluate the relationship between radial BMD and grip strength in young athletes. A significant positive correlation was found between radial BMD and grip strength in the dominant forearm, which suggested that grip strength could be one of the determinant factors of radial BMD in the dominant forearm of young college athletes.

Adolescent Combat Athletes

Nasri et al (2013) compared 50 combat sport athletes with 30 sedentary subjects to investigate the correlation between bone parameters and grip strength (GS) in hands, and found that grip strength of non-dominant arm significantly correlated with BMD of both spine and legs, and it was also the best predictor for BMD at different sites in combat athletes.

Postmenopausal Women

Osei-Hyiamanet al (1999) studied 1168 postmenopausal Japanese women to examine the influence of grip strength on BMD of the metacarpal (index finger) and found that grip strength significantly correlated with BMD and subjects with stronger grip strengths had a decreased risk for low BMD.

Rattanachaiyanontet al (2002) studied 177 healthy peri / post-menopausal Thai women and determined the relationship between distal radius bone mineral density (BMD) and grip strength (GS) and found that BMD had statistically significant but weak, positive correlation to GS in both dominant and non-dominant sides, with a stronger correlation of BMD to the contralateral dominant GS than to the ipsilateral non-dominant GS.

Sahinet al (2002) studied 187 postmenopausal Thai women and assessed the relationship of grip strength to site-specific BMD of the metacarpal bone and also axial BMD. Grip strength was correlated positively with the BMD of the nondominant hand, and also correlated positively with femoral neck BMD. This study provided support for a site-specific and also systemic relationship between muscle and bone.

Of the total 11 studies, there were six population-specific studies on normal healthy population (adolescents, adults, men, women, older adults, older women), two studies on healthy athletes (young athletes, combat athletes), and three studies on postmenopausal women (Japanese, Thai, Turkish). Whilst the question of site-specific or systemic still remains unanswered, the answer was reported to be influenced by many other variables such as gender, body weight, hand dominance and menopausal status. Albeit, there is a positive association and strong correlation existing between grip strength and bone mineral density, with grip strength being an independent predictor of BMD in some population.

There is need for prospective longitudinal studies to explore the cause-effect inter-relationship, and there were no studies found on older men, and on patient population with osteoporosis, which is the dearth scientific need of the hour in evidence for orthopedic examination. There is need for controlled clinical trials on interventions aimed at improving grip strength and their effects on BMD in osteoporotic men and women.

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Case Report

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Fixation of Distal Humerus Fracture Preserving the Extensor Mechanism of Elbow

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Abstract

Introduction: Intra-articular fracture of the distal humerusis a relatively rare injury &constitutes 0.5% to 0.7% of all fractures and 30% of elbow fractures. Traditionally these fractures have been managed operatively with various extensor mechanism disrupting approaches which are often associated with delayed / non union of the olecranon, triceps muscle weakness and osteotomy related implant prominence. Open Reduction and internal fixation of these fractures can be effectively accomplished through an 'EXTENSOR MECHANISM on APPROACH.'We present a detailed description of surgical technique and management of Compound Intra- articular fracture distal end of humerus. *Case Report*: 25 year old male patient came to our Hospital following a fall from a height of 20 feet on his right elbow. Patient had a Compound Type III B injury (Gustillo Anderson Classification) with type C 2 distal humerus fracture. The fracture was initially managed with debridement, surgical toilet and external fixator application. This was followed with two weeks of regular wound care supplemented with parentral antibiotics. After the wound condition improved, definitive fixation of the intra-articular fracture was done with dual plating through an extensor mechanism on approach. *Conclusion:* Intra-articular fractures of distal humerus can be treated safely and successfully through extensor on approach which avoids extensor mechanism disruption and also avoids complications of olecranon osteotomy. This approach can be converted to conventional olecranon osteotomy if required intra-operatively.

Keywords: Distal Humerus; Plating; Extensor on Approach; Extensor Preserving.

Introduction

Intra-articular fractures of the distal humerusis a relatively rare injury &constitutes 0.5% to 0.7% of all fractures and 30% of elbow fractures. These fractures are seen in the younger age groups secondary to high energy trauma and in elderly women as a result of relatively lower energy trauma. The chances of functional impairment and deformity are very high following conservative treatment of such distal intra-articular fractures of the humerus, and stable internal fixation may be difficult to achieve due to the complexity of the fracture and associated osteoporosis.Good anatomical alignment, stabilization, gentle soft tissue handlingand early mobilization can provide satisfactory results. Severe comminution, bone loss, and osteopenia predispose to unsatisfactory results because of inadequate fixation of the fracture.

Open Reduction and internal fixation of these fractures can be effectively accomplished through an 'EXTENSOR MECHANISM on APPROACH.' Traditionally these fractures have been managed operatively with various extensor mechanism disrupting approaches (1-7) which are often associated with delayed / non union of the olecranon,

triceps muscle weakness and osteotomy related implant prominence (8-10)

Case Report

A 25 year old male patient came to K.L.E. Hospital & Medical Research Center casualty following a fall from a height of 20 feet on his right elbow while working in a factory. Patient had a Compound Type III B injury (Gustillo Anderson Classification) with type C 2 distal humerus fracture. The wound was grossly contaminated with grease and initially managed with debridement, surgical toilet and external fixator application. This was followed with two weeks of regular wound care supplemented with parentral antibiotics. After the wound condition improved, definitive fixation of the intra-articular fracture was done with dual plating through an extensor mechanism on approach.

Patient was administered G.A. and put in a prone position, a posterior longitudinal incision taken extending 3 to 4 cms distal to the tip of olecranon and full thickness fascio-cutaneous flap was elevated medially and laterally. Next, the ulnar nerve was indentified along the I-M septum and dissected and separated. The medial and lateral borders of the triceps were elevated from their respective inter-muscular septae. Laterally, the dissection was continued anterior to the anconeus allowing it to be elevated along with the triceps and thus preserving it'sneuro-vascular supply. The triceps was then freed from the posterior aspect of humerus in an extra-periosteal fashion and the medial and lateral windows connected with blunt dissection followed by medial and lateral elbow arthrotomies posterior to the collateral ligament complexes. This, allows visualization of about 60% of the overall articular cartilage surface of the distal part of humerus. Then, the fracture fragments were reduced anatomically under direct vision and indirectly under fluoroscopy. Provisional fixation was done with k-wires with care being taken not to interfere with screw and plate placement. The reconstructed, distal articular block was approximated to the humeral diaphysis. Fixation was completed with fixation of orthogonal plates on the medial and postero-lateral surface with reconstruction plates and multiple screws. The K wires were removed and final assessment was done to assess stability, range of motion and confirmation done that no implants were in the joint and the olecranon fossa prior to closure. The triceps fascia was repaired laterally and medially with absorbable sutures and the ulnar nerve was anteriorly transposed followed by closure in layers.

Postoperatively, dressing was changed after two days and active assisted elbow movements & grip strengthening therapy program started. Radiological fracture union was seen in eight weeks post-operatively patient had good ROM with result being Excellent as per the QUICKDASH score with no triceps strength loss. No signs of infection were present.

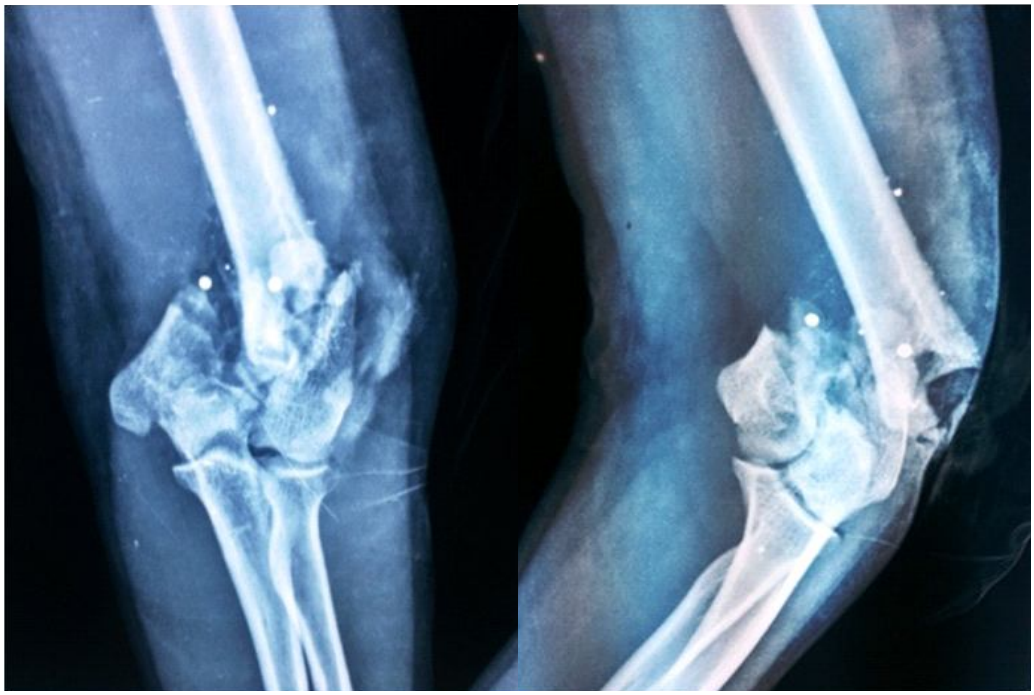

Fig. 1: Pre Op AP & Lateral Views

Fig. 2: X rays after Ex-Fix Application

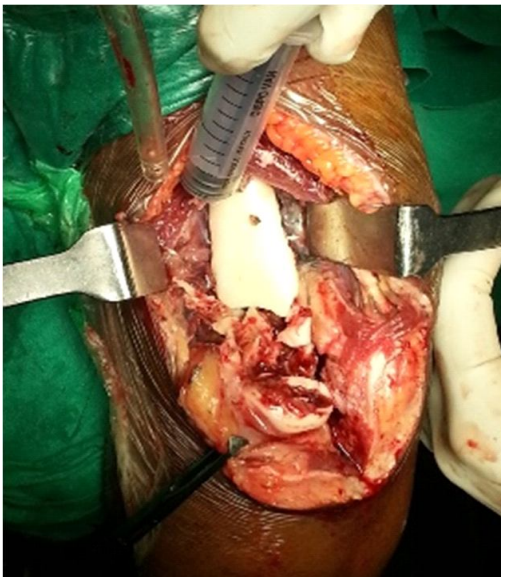

Fig. 3: Fracture Exposure with intact triceps

Fig. 5: Plating with triceps preservation

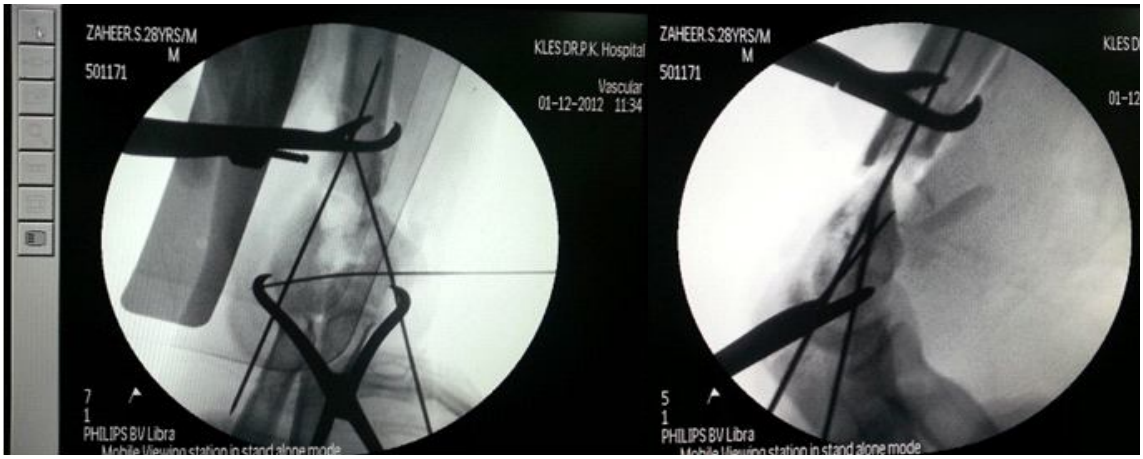

Fig. 4: Provisional Fixation with K-wires

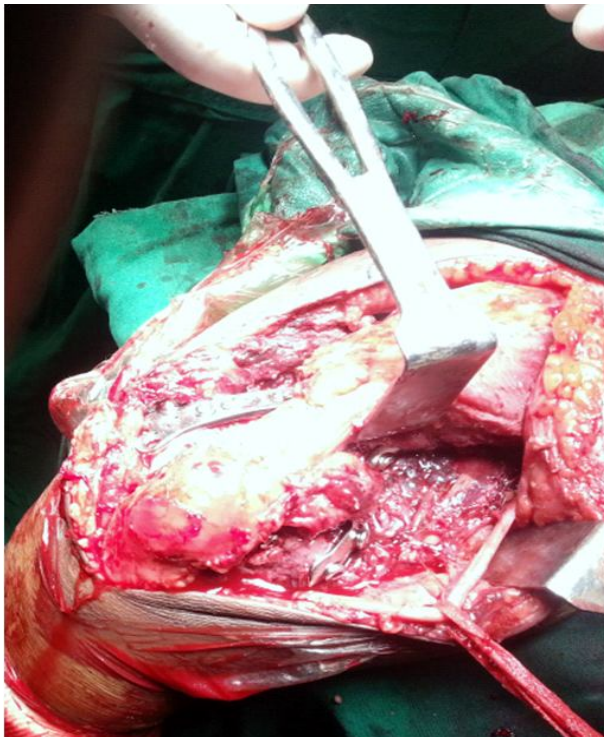

Fig. 6: Plates over both columns with intact triceps

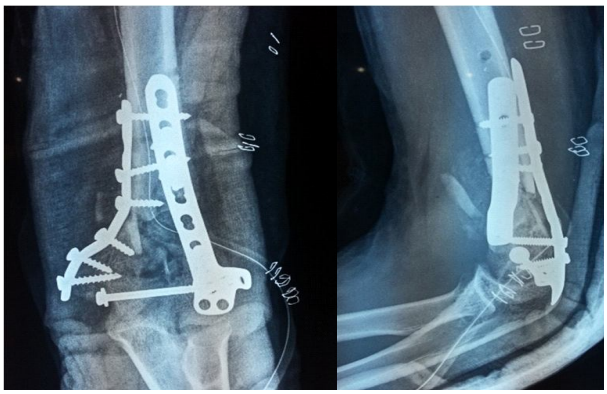

Fig. 7: Post Operative AP & Lateral Views

Fig. 8: Function at final follow up showing the healed surgical scar and full flexion

Fig. 9: Function showing full extension and supination

Discussion

Intra-articular fractures of the distal humerus are relatively rare but difficult fractures to treat. Gentle soft-tissue handling, anatomic articular reduction, rigid fixation and early mobilization are the pillars for a successful outcome. These fractures have historically been approached through extensor-disrupting approaches which may result in loss of elbow extension or complications associated with olecranon osteotomy. This fracture can also be approached with the technique of anconeus muscle preserving approach with bi-columnar visualization through lateral and medial windows that avoids the disruption of the triceps muscle or it's insertion. The intact sigmoid notch serves as a template for reduction. We managed anatomic articular reduction and bi-columnar fixation without disrupting the extensor apparatus.

Conclusion

Fractures of distal humerus can successfully be treated with 'Extensor on Approach'. The advantages of this approach include early rehabilitation due to preservation of the extensor mechanism of elbow and avoidance of complications of olecranon osteotomy such as non/delayed union and hardware prominence. Another advantage of this approach is that it can easily be converted to an olecranon osteotomy without any additional soft tissue injury

if the reduction cannot be obtained or inadequately assessed.

Clinical Message

Intra-articular distal humerus fractures are difficult to treat. It is very important to try and avoid as much soft tissue disruption as possible for better functional outcome and "Extensor on approach" provides one such excellent alternative to preserve the extensor apparatus of the elbow.

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Short Communication

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Exercises for Periarthritis Shoulder/ Adhesive Capsulitis/ Frozen Shoulder - An Overview

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Abstract

This short communication sought to perform an overview of research on efficacy of exercises in periarthritis shoulder / adhesive capsulitis / frozen shoulder. The included evidence demonstrated efficacy of exercises either individually (active range of motion exercises) or as comparison between types of exercise (scapulothoracic versus glenohumeral), comparison between exercises and other conservative treatments (supervised neglect, Maitland mobilization), exercises administered in combination (stretching and as a home exercise prescription an adjunct to other orthopaedic procedures such as hydroplasty, distension arthrography and manipulation under anesthesia. Although, limited evidence existed for its individual use, combination with other treatments might be suggested as a viable and cost-effective treatment option in orthopaedic rehabilitation of people with frozen shoulder.

Keywords: Shoulder Rehabilitation; Shoulder Orthopaedics; Orthopaedic Rehabilitation; Exercise Therapy.

This short communication sought to perform an overview of research on efficacy of exercises in periarthritis shoulder / adhesive capsulitis / frozen shoulder.

Active Range of Motion Exercise

Lin et al[1] evaluated and compared the effects of an intra-articular injection of corticosteroid and lidocaine versus active ROM exercise in the treatment of primary adhesive capsulitis in 79 overweight and normal-weight patients. The ROM exercises were started immediately after injection and was performed four times daily. Both groups had improved Constant scores, but the responses were better in normal weight group at 8 weeks.

Scapulothoracic Versus Glenohumeral Exercises

Celik[2] compared the effects of two different exercise programs on pain, range of motion (ROM), and function in 30 patients with frozen shoulder. Supervised exercises were given for 6 weeks (30 sessions) in addition to transcutaneous electrical nerve stimulation, cold pack, and nonsteroidal anti inflammatory drugs; and glenohumeral ROM exercises. The second group received scapulothoracic exercises in addition to above. The scapulothoracic exercises given in addition were better than glenohumeral ROM exercises for decreasing pain and increasing ROM in patients with frozen shoulder.

Active Stretching and Supervised Neglect Exercise

Lubisand Lubis[3]compared the serum levels of proteins related to frozen shoulder, such as matrix metalloproteinase (MMP), tissue inhibitor of metalloproteinase (TIMP) and transforming growth

factor-beta (TGF-â) before and after physical exercise active stretching and gentle thawing in frozen shoulder and normal subjects who were randomly divided into intensive stretching and supervised neglect groups. "Increased MMPs and decreased TIMPs were significantly greater after intensive stretching than after supervised neglect exercise. Abbreviated Constant score improvement was significantly higher in intensive stretching group than in supervised neglect group."

Maitland Mobilization and Exercises

Maricaret al[4] performed a single-case design (ABCBC)to investigate the responses for baseline phase (phase A), exercises (phase B), and exercise plus mobilization (phase C) where the phase C treatment included: Maitland "accessory" glenohumeral mobilization techniques, anteroposterior mobilization in shoulder flexion and longitudinal caudad in shoulder abduction. All phases showed improvements in SPADI and ROM assessments, but Phase C showed better changes and adding exercise to mobilization was also cost-effective.

Exercises Following Hydroplasty

Callinanet al[5] performed a retrospective review to evaluate the effectiveness of a hydraulic distention technique (hydroplasty) combined with a therapy program for treatment of 60 patients with idiopathic frozen shoulder. The active range of motion improved for all the shoulder movements: flexion 28 degrees, abduction 42 degrees, internal rotation 22 degrees, and external rotation 26 degrees.

Distension Arthrography and Home Exercise

Piotteet al[6]measured the effect of repeated distension arthrographies combined with a home exercise program on disability, pain, range of motion, and pain-free static strength in 15 subjects with adhesive capsulitis of the shoulder. The distension arthrography was performed thrice, with steroid at 3-wk intervals followed by a home exercise prescription. The effects were procedure-specific, without an added value of third, and were not exercise-specific.

Manipulation under Anesthesia (MUA) with Home Exercises (HEx) Versus Home Exercises Alone

Kivimäkiet al[7] compared MUA with HEx versus HEx alone in 125 patients who were randomly assigned to the manipulation group (n = 65) or control group (n = 60). Both groups were instructed in specific therapeutic exercises and clinical data were gathered at baseline and at 6 weeks and 3, 6, and 12 months after randomization. There were no differences between the two groups in pain or working ability. The MUA group had slightly better improvements in the range of movement compared to HEx group.

The included evidence demonstrated efficacy of exercises either individually (active range of motion exercises) or as comparison between types of exercise (scapulothoracic versus glenohumeral), comparison between exercises and other conservative treatments (supervised neglect, Maitland mobilization), exercises administered in combination (stretching and as a home exercise prescription an adjunct to other orthopaedic procedures such as hydroplasty, distension arthrography and manipulation under anesthesia. Although, limited evidence existed for its individual use, combination with other treatments might be suggested as a viable and cost-effective treatment option in orthopaedic rehabilitation of people with frozen shoulder.

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Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006; 35: 540-7.

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Article in supplement or special issue

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Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000; 71: 1792-801.

Unpublished article

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Personal author(s)

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[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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