

Case Report

Total elbow arthroplasty surgery in neglected elbow stiffness post open reduction and internal fixation with plate and screw: a case report

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ABSTRACT

Post-traumatic and post-operative stiffness of the elbow joint constitutes a significant problem since the elbow is prone to develop soft-tissue contractures and heterotopic bone formation especially if happened in dominant arm. Total elbow replacement is considered as an ultimate treatment in salvaging a stiff elbow which has failed conservative and operative therapeutic procedures to overcome the stiffness and return the elbow to an effective functional arc. A 35-year-old female came to orthopaedic outpatient clinic in Sanglah Hospital, complaining on stiffness in her right elbow since one year prior to admission. This complain was felt after she underwent internal fixation on July 19th 2016, for closed fracture right monteggia bado type-3 post internal fixation. After the surgery, she couldn't move her elbow because of inappropriate physiotherapy. Neglected elbow stiffness in this patient was treated surgically with total elbow arthroplasty after physiotherapy has failed to improve her range of motion over 1-year period postoperatively. This decision stated when nonsurgical treatment fails, the patient who has realistic expectations of eventual outcome and who can comply with the arduous postoperative rehabilitation program may be a surgical candidate. Total elbow arthroplasty conducted for these patients resulted in satisfying functional outcome with using quick disabilities of the arm, shoulder and hand (DASH) score improved from 81.8 to 43.2 postoperatively and no complication was reported.

Keywords: Neglected elbow stiffness, Total elbow arthroplasty, Quick DASH score

INTRODUCTION

Elbow joint is a complex joint comprises three articulations, ulno-humeral, radio-capitellar, and proximal radioulnar. In performing its primary function as a lever for lifting and placing the hand appropriately in space, the stability of elbow joint is provided by combination of osseous and ligamentous restraints, with the normal range of carrying angle in 11-16° valgus. The normal range of flexion extension of elbow is 0°-145° and the functional range of motion required for daily activities is 30°-130° of flexion extension and 50° of supination to 50° of pronation. Flexion of elbow up to 149° may also be required for some activities like using a cell phone and typing on a keyboard.¹ Therefore, in patients with the range of flexion <120° and loss of

extension >30°, elbow stiffness can be suspected and may need further intervention in order to decrease patient's morbidity.^{1,2}

As one of the most common causes of elbow stiffness, trauma contributes to 3 to 20% of the total incidence.² Post-traumatically, due to its anatomical features, elbow joint is prone to develop soft-tissue contractures and heterotopic bone formation, resulting in post-traumatic and post-operative elbow stiffness. Recent research has increased the knowledge of the biomechanical and biochemical processes causing post-traumatic elbow stiffness but the exact mechanisms are still largely unknown.³ Neurological assessment is imperative and the ulnar nerve is particularly susceptible to injury associated with the initial trauma. In cases with severe scarring, the

normal gliding and stretching of the nerve during elbow movements may be disturbed and any procedure increasing elbow mobility may create ulnar nerve symptoms if the nerve is embedded in scar formation.³

Although displaced fractures around the elbow joint are commonly treated by internal fixation, the exact incidence of posttraumatic elbow stiffness remains difficult to estimate due to its multifactorial pathogenesis and variable time of manifestation. The stiffness itself may be caused by the initial trauma, surgical trauma, or the combination of both. Therefore, it is also difficult to predict the presence/absence and degree of stiffness in any given case.² Morrey explained the pathoanatomic of elbow stiffness as either extrinsic or intrinsic. Extrinsic stiffness includes the capsule, collateral ligaments, and the extra-articular soft tissues surrounding the joint (muscles, subcutaneous tissue, and skin). Extra-articular malunions and heterotopic ossification (HO) fall into this category. The intrinsic factors are articular problems like intra-articular adhesions, articular incongruity and malunions, posttraumatic arthritis, and osteophytes causing mechanical blocks or soft tissue in the coronoid or olecranon fossae. A mixed contracture is when patients have both intrinsic and extrinsic sources limiting their motion.⁴

In order to establish the diagnosis, simple radiographs of the elbow in anteroposterior and lateral views are sufficient in most cases. In cases of contracture greater than 30°, the anteroposterior image presents distortions and, in these cases, oblique images are the appropriate choice. In addition to assessing joint deformities, the joint space, quality of the joint cartilage, joint congruence, presence of heterotopic ossifications and location of osteosynthesis material should be evaluated.⁵

After establishing the diagnosis of elbow stiffness, proper treatment planning should also be done. Total elbow replacement is often considered as an ultimate treatment in salvaging a stiff elbow which has failed conservative and operative therapeutic procedures to overcome the stiffness and return the elbow to an effective functional arc. Furthermore, some modifications in implant design and operative techniques may be needed for some individual patients in order to produce a reliable long-term outcome.⁴

Total elbow arthroplasty has been a reliable method of treatment for elbow arthritis for over 40 years. The indications for total elbow arthroplasty have continued to expand to include the management of acute traumatic and post-traumatic conditions. Cobb and Morrey proposed the use of non-custom total elbow replacement for the treatment of complex distal humeral fractures in the elderly in 1997. The role of total elbow arthroplasty for the management of complex distal humeral fractures has met much debate since.⁶

There are two general types of implants for the arthritic elbow: linked and unlinked. An unlinked or non-constrained prosthesis relies on adequate bony support and collateral ligaments for stability. Linked implants are joined by a “sloppy hinge” to allow for some varus and valgus laxity during range of motion of the elbow; early loosening is a concern with these implants. b. In unlinked implants, the humeral and ulnar components are not joined, and stability is provided by the surrounding soft tissues; instability is the main concern with this implant construct. c. In patients with inflammatory arthritis, the soft tissues often are attenuated, and the threshold for using a linked prosthesis.⁶

This study reported a case of neglected elbow stiffness post internal fixation in a 35-year-old female with the chief complaint of stiffness in the right elbow. She was suspected as having a neglected elbow stiffness by history taking and physical examination. Radiology investigations was performed and after establishing a working diagnosis of neglected elbow stiffness post internal fixation, elbow arthroplasty is planned as the mainstay of her treatment. In terms of functional outcome, this patient had significant improvement of quick disabilities of the arm, shoulder and hand (DASH) score improved from 81.8 to 43.2 postoperatively and none had complication.

CASE REPORT

A 35-year-old female came to Orthopaedic Outpatient Clinic in Sanglah Hospital, complaining on stiffness in her right elbow since one year prior to admission. This complain was felt after she underwent a surgery on July 19th 2016, with the diagnosis of closed fracture right Monteggia Bado type-3 post internal fixation.

After the surgery, she couldn't move her elbow. Patient has done physiotherapy but her condition doesn't improve. She has no history of bonesetter.



Figure 1: Physical examination of the patient.

From physical examination, angulation was seen and tenderness was found around the elbow (Figure 1). Radial artery was palpable, and capillary refill time was less than two seconds. There were 0/40 active range of motion (ROM) of elbow, 30/40 active ROM of wrist and 0/90 active ROM of MCP-IP. Plain radiograph of her right elbow in anteroposterior and lateral view showed that the

implants were in good position. This patient was diagnosed with neglected stiffness post internal fixation (18th august 2016) and total elbow arthroplasty was later performed (Figure 2). Clinical pictures durante and post-operative shows in (Figure 3).



Figure 2: Right elbow x-ray (A) AP (B) lateral view pre-operative (C) post operatively using internal fixation.



Figure 3: Clinical pictures durante and post-operative.



Figure 4: Right elbow x-ray AP/lateral view Post-operatively.

Postoperative radiograph examination showed that the implants were in good position and the postoperative scar was in good condition, though the long-term outcomes require further investigations. Quick DASH score improved from 81.8 to 43.2 postoperatively. No complication was reported (figure 4).

DISCUSSION

Stiffness of the elbow can result from congenital abnormalities, paralytic deformities, degenerative arthrosis, burn contractures, sequela of joint infections, and, most commonly, trauma to the elbow.⁷ According to its pathology, posttraumatic elbow stiffness can be classified as extrinsic (extraarticular), intrinsic (intra-articular), or mixed. Extrinsic or extra-articular pathology includes that of the periarticular soft tissue and bone but excludes articular cartilage lesions. Skin contractures or subcutaneous scarring from incisions or burns can result in limited elbow motion. Direct capsular injury, or injury to the brachialis, biceps, or triceps muscles, can cause hemarthrosis, which may result in scarring and contracture with limitation of motion. Prolonged pain can produce both voluntary and involuntary guarding of the elbow during motion, eventually leading to contracture of the elbow capsule and, in some cases, the brachialis muscle. This pain mechanism is postulated as a possible explanation for stiffness occurring after relatively minor trauma to the elbow. Entrapment neuropathies, most commonly of the ulnar nerve, likewise can result in stiffness and loss of range of motion secondary to prolonged pain. Intrinsic causes of elbow stiffness are articular incongruity, loss of articular cartilage, hypertrophic callus on the articular surface, intra-articular adhesions, fibrosis, soft-tissue encroachment within the coronoid or olecranon fossa, or hypertrophic osteophytes that mechanically block motion.^{7,8}

Important elements of the patient history are the subjective description of motion deficits, degree of pain, duration of elbow stiffness, prior surgery of the elbow, and presence or absence of previous infection. Deficits in forearm pronation and supination are more likely caused by radio-capitellar joint pathology, although forearm and wrist pathology must be ruled out.^{9,10} Deficits in flexion and extension are most often caused by ulno-humeral joint pathology. Unless there is severe heterotopic ossification (HO) or complete ankylosis, the patient will usually experience loss in one functional motion arc, pronation-supination or flexion-extension. The findings in our patient are consistent with this, where her elbow range of motion was limited, followed by mild pain. In a study by Bruno et al is stated that posttraumatic elbow stiffness usually is not painful, and that pain often implies arthrosis, impingement, entrapment neuropathy, or, less frequently, instability.⁷ In case of our patient here, those possible underlying pathologies still cannot be ruled out and further investigation is still needed.⁹

The physical examination begins with inspection of the skin, noting scars, areas of skin loss, and areas of fibrosis. The nature of conditions such as skin loss, fibrosis, or scar adherence to underlying muscles and tendons and their contribution to stiffness should be assessed. Passive and active range of motion should be recorded to help determine current functional limitations and to be able to document the efficacy of subsequent treatment modalities. This is in accordance with the finding in our patient, where in the physical examination, we found angulation deformity in her right elbow. There was no swelling found and the scar from previous surgery was in good condition. Tenderness was also found around the right elbow with normal neurovascular and saturation. Flexion range of motion was restricted, but the extension range of motion was within normal limit. Morrey et al determined that the functional range of motion required for activities of daily living is extension-flexion of 30° to 130° (an arc of motion of 100°) and pronation-supination of 50° to 50°. Terminal flexion is more important in performing activities of daily living than is terminal extension. The end point of restricted motion should also be noted. A soft end point implies soft-tissue constraint; a hard end point may be attributed to bony impingement, although this distinction sometimes can be difficult to ascertain.¹⁰

For the investigation, anteroposterior, lateral, and radiocapitellar oblique radiographs are often used to evaluate the degree of degenerative changes, to rule out impingement from hardware, and to assess HO, fracture healing, and deformity. Stress radiographs can provide additional information when there is evidence of instability. In patients who have significant loss of pronation and supination, radiographs of the forearm and wrist should be obtained. When severe deformity or bridging HO is present, computed tomography, with both axial images and two dimensional or three-dimensional reconstructions, may be necessary to assess the bony architecture of the joint. Computed tomography may also provide useful information in patients with lesser degrees of arthritic involvement, demonstrating whether an anterior or a posterior approach would provide a more direct exposure for osteophyte removal and debridement. Magnetic resonance imaging may be useful in assessing medial and lateral collateral ligament integrity. Focal articular cartilage loss can be difficult to appreciate on preoperative imaging studies and may become apparent only during arthrotomy.⁵ In our case here, only anteroposterior and lateral plain radiography was done for the patient. The plate and screw from the previous surgery was seen in good position, though heterotrophic ossification still couldn't be ruled out. Further CT scan, MRI imaging, or electrodiagnostic studies might be needed in the future in order to help localize the lesion and determine further pathologies.¹¹

Neglected elbow stiffness in this patient was treated surgically with total elbow arthroplasty after physiotherapy has failed to improve her range of motion

over 1-year period postoperatively. This decision is in accordance with a study by Lindenhovius et al that stated when nonsurgical treatment fails, the patient who has realistic expectations of eventual outcome and who can comply with the arduous postoperative rehabilitation program may be a surgical candidate. Furthermore, the assessment of variables, including etiology of the stiffness and degree of functional impairment, dictates the surgical approach elected. For patients with little or no articular cartilage degeneration, soft-tissue releases, including anterior capsulectomy, brachialis muscle slide, and debridement of all encroaching soft tissue in the fossae of the distal humerus, are indicated. Patients with moderate degenerative changes can be treated with limited bony arthroplasties, which include debridement arthroplasty or the outerbridge- kashiwagi ulnohumeral arthroplasty. Younger patients (aged <60 years) with severe degenerative changes can be treated with fascial interposition arthroplasty with or without application of a joint distractor. Though total elbow arthroplasty conducted for this patient seems to have promising functional outcome, long-term follow-up is still needed.⁹⁻¹¹

CONCLUSION

Our case presented Neglected Elbow Stiffness Post Internal Fixation treated surgically with total elbow arthroplasty. We successfully performed total elbow arthroplasty for this patient in Sanglah Hospital, Bali. Total elbow arthroplasty conducted for these patients resulted in satisfying functional outcome as assessed using quick DASH score and no complication was reported. It is of great importance for the patient to know exactly the extent of injury, what she can expect from a surgical operation, and whether she may be able to participate actively in any type of rehabilitation. Factors that will influence the final result are the delay between the time of injury and surgical intervention, the initial mechanism of injury, and follow up of the patient. Despite the surgical invention done for this patient, the long-term outcomes require further investigations.

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