

УДК 617.573:616.727.3-001.6](045)=111

DOI: <http://dx.doi.org/10.15674/0030-59872024322-27>

Outcome of neglected posterior elbow dislocation with gross ligamentous instability by arthrolysis combined with circumferential reconstruction of MCL, LUCL using triceps tendon fascia

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Dislocation of the elbow joint, which has not been treated for more than 3 weeks, is considered outdated. Due to the high risk of complications and the uncertainty of the effectiveness of the treatment of an old dislocation of the elbow joint, it is quite a difficult task for surgeons. There are various described techniques for repairing the lateral ligamentous complex (including the LUCL) and the medial collateral ligament. Objective. To describe the author's unique technique, which consists in using one graft to restore both lateral and medial ligaments. Methods. The personal experience of treating 14 patients with chronic dislocation of the elbow joint with deformation and multidirectional instability is presented. All patients were operated on by one surgeon using the arthrolysis method in combination with MCL, LUCL reconstruction using an ipsilateral autograft of the triceps tendinous fascia. Further observation was carried out at 3, 6 and 12 weeks, as well as at 6 and 9 months. In our case, we evaluated stability, range of motion, and the presence of pain syndrome. The results. Satisfactory results were obtained in terms of pain-free full range of motion and adequate stability of the elbow joint in all cases. All patients performed their active routine exercise with minimal limitation. Conclusions. The advantage of the technique is a unique comprehensive approach that uses one circular graft to restore both the lateral and medial ligament complexes, which ensures stability and possible early rehabilitation. This leads to an excellent functional result — a quick restoration of the full range of motion in the joint and its stability.

Застарілим вважається вивих ліктьового суглоба, який не лікували більше 3 тижнів. Через високий ризик ускладнень і невизначеність результативності лікування застарілого вивиху ліктьового суглоба є досить складним завданням для хірургів. Існують різні описані методики відновлення латерального зв'язкового комплексу (включаючи LUCL) і медіальної колатеральної зв'язки. Мета. Описати унікальну авторську методику, яка полягає у використанні одного трансплантата для відновлення як латеральної, так і медіальної зв'язок. Методи. Наведено власний досвід лікування 14 пацієнтів із застарілим вивихом ліктьового суглоба з деформацією та різноспрямованою нестабільністю. Усі хворі були прооперовані одним хірургом методом артроділізу в поєднанні з реконструкцією MCL, LUCL із використанням іпсилатерального аутографта сухожилкової фасції трицепса. Подальше спостереження проводилося на 3, 6 і 12 тижні, а також на 6 і 9 міс. У нашому випадку ми оцінювали стабільність, діапазон рухів і наявність больового синдрому. Результати. Отримали задовільні результати з точки зору повного діапазону рухів без болю й адекватної стабільності ліктьового суглоба в усіх випадках. Усі пацієнти виконували свої активні рутинні фізичні навантаження з мінімальним обмеженням. Висновки. Перевагою методики є унікальний комплексний підхід, який використовує один циркулярний трансплантат для відновлення як латерального, так і медіального комплексів зв'язок, що забезпечує стабільність і можливу ранню реабілітацію. Це приводить до відмінного функціонального результату — швидкого відновлення повного обсягу рухів у суглобі та його стабільності. Ключові слова. Ліктьовий суглоб, вивих, застарілий, нестабільність, реконструкція.

Keywords. Elbow joint, dislocation, obsolete, instability, reconstruction

Introduction

Elbow is the most common joint to be dislocated in children & the second most common joint to be dislocated in adults [1]. It may be anterior or posterior. In posterior type of elbow joint dislocation, the radius and ulna dislocate posterior to the humerus, and in anterior elbow joint dislocation, they dislocate in front of the humerus. Posterior dislocation is more frequent than the anterior type. An elbow joint posterior dislocation is described as neglected if it is not treated/inadequately for 3 weeks or more [2]. In developing countries like India, these type of presentations are very common. Low education level, poverty, delay in seeking medical treatment, unethical procedures by local bone setters & in-accessability to proper health care are all potential reasons. Due to the high risk of complications and the uncertainty of the outcome, the management of neglected elbow dislocation is quite challenging. There are various described extensive techniques for repair of lateral ligamentous complex (including LUCL) and the medial collateral ligament. In this article, we describe a unique approach that uses a single circular graft to rebuild both the lateral and medial ligaments.

Materials and methods

This is a prospective study conducted in the department of Orthopaedics, in a tertiary care hospital of Bhubaneswar. A total of 14 patients presented to our OPD with neglected/ill-treated dislocation of elbow without any obvious bony fractures in a duration of 2 years.

Exclusion criteria:

1. Associated bony fractures
2. Anterior elbow dislocations
2. Fresh injuries (< 3 weeks)
3. Paediatric patients (< 16 yrs)
4. Compound injuries with pre-existing wound over the elbow
5. Distal neuro-vascular deficit

All patients were operated by a single surgeon by arthrolysis combined with Circumferential reconstruction of MCL, LUCL using ipsilateral triceps tendon fascia autograft.

Surgical Technique

Patient in lateral decubitus position on contralateral side under GA/brachial block with injured arm placed on support, with forearm and hand hanging in air, so that they can be easily mobilised, protection was given over pressure points. Under fluoroscopy guidance, elbow instability was evaluated by examination. Reduction was done using Morrey's described technique and ligament reconstruction was done us-

ing the single loop technique described by van Riet et al., with a few modifications [3, 4].

Posterior midline incision was given under tourniquet control. Ulnar nerve was identified first, which was followed by a thorough release of the fibrosis around the joint. Full-thickness fascio-cutaneous flaps were elevated to expose the medial & lateral surfaces of elbow. A 7-mm-wide central slip of Triceps tendon fascia was collected from the tip of the olecranon to 10 cm proximally. In the antero-posterior plane, the tendon graft's distal portion is thicker. The graft's proximal four-fifths are a sheet that was formed into a tube that fits through a 4.5-mm drill guide. When FCU tendon was anteriorly reflected, the medial proximal ulna and medial epicondyle are visualised. Sublime tubercle of the proximal ulna was cleared of all the soft tissue attachments on the medial side. Kocher interval was identified. The anconeus was reflected. Remnants of the LCL complex were recognised. The annular ligament was separated. Posterior interosseus nerve was protected by keeping the forearm pronated. The capitellum and lateral epicondyle can now be seen clearly.

The origin of the LUCL was disclosed by palpating and exposing the supinator crest on the lateral side of the ulna. We carried out triceps V-Y plasty. The palmaris longus tendon was used in a method first described. We extracted triceps tendon fascia for our procedure & used it like palmaris longus tendon described by Arafles et al. [5]. All scarred tight collaterals, as well as the anterior and posterior capsules were released from the humeral side & joint was reduced. The articular surface was stable but not in good health. The soft tissue around the articular cartilage was not nibbled in order to protect the articular cartilage. Posterior bundle of the LUCL and the anterior bundle of the medial collateral ligament were repaired in order to stabilise the reduced joint. The isometric point was identified & a 4.5-mm hole was drilled through the humerus axis of rotation, from the lateral side's capitulum's centre to the medial epicondyle's antero-inferior surface with careful protection of ulnar nerve (Fig. 1, 2).

Through a 4.5-mm oblique drill hole in the ulna which was created from the sublime tubercle on the medial ulna to the supinator crest on the lateral side of the ulna, the anterior band of the MCL is restored. Similarly, LUCL was reconstructed using an oblique 4.5-mm tunnel which is drilled from the lateral to medial side of the ulna. All drill holes were curetted to allow the tendon graft to move freely. In order to drag the graft through the complete circuit, a trailing suture was inserted through each tunnel. The leading

end of the graft was passed lateral to medial through the supinator crest tunnel to form the LUCL (Fig. 3).

Graft was anchored and tensioned by placing an interference screw in the humeral tunnel while keeping the elbow in pronation (Fig. 4).

The graft was now transferred through the medial side of the humeral tunnel and secured with a second interference screw at the sublime tubercle in the ulnar tunnel, keeping the elbow in flexion. Throughout this process, but especially before the graft is tensioned, it's crucial to make sure the elbow is completely reduced.

The Kocher interval was closed with non-absorbable sutures, and the flexor-pronator mass is restored back to the medial epicondyle. The skin is closed in layers. Stability was checked at the end of the procedure, which was verified by testing ROM in all planes.

Post-Operative Rehabilitation

For one week, the elbow immobilised in an above-elbow plaster slab with the elbow flexed 90 degrees and the forearm in neutral rotation. We allowed patients to start active mobilisation. To enable pain-

free movement, post-operative analgesic management was taken. Over the course of three weeks, active motions and progressive strengthening exercises were initiated. After four weeks, light weightlifting was introduced, followed by three months of full weightlifting. Follow-up was undertaken at 3, 6, and 12 weeks, as well as at 6 and 9 months. In our case, we evaluated stability, range of motion, and any pain. We had satisfactory outcomes in terms of pain-free full range of motion and adequate elbow joint stability in all cases. All patients were able to do all of their active routine physical activities with minimal restriction of ROM.

Results

The mean age of patients was 33.6 (14–50) yrs. There was a female predominance with male to female ratio of 5:9. The mean duration of presentation after injury was 1.63 months. The most common complaints were deformity & restricted movements. 10 patients were treated at local bone setters while 4 of them received no treatment.



Fig. 1. Pre-operative radiograph



Fig. 3. Intra operative photo showing interference screw placement



Fig. 2. Intra operative photo showing graft passing



Fig. 4. Post operative radiograph

Discussion

The radio-capitellar and ulno-humeral joints, together with the MCL and LUCL are the stabilizers of the elbow joint. The LUCL usually provides posterolateral stability, while the anterior bundle of the MCL performs a crucial function in stabilising the elbow during valgus stress [6]. The majority of uncomplicated elbow dislocations recover satisfactorily after closed reduction without any surgical intervention and with the right mobilisation [7]. Injuries to the radial head, coronoid, or ligaments that are not appropriately treated are the cause of chronic instability or missed dislocation of the elbow [8]. Old unreduced elbow dislocations are frequent in rural regions due to lack of awareness. Before they are visited by a professional, such patients are usually neglected and mistreated. Up to three weeks after an

injury, most surgeons attempt closed reduction for elbow dislocation. After three weeks due to soft tissue contracture, closed reduction becomes difficult. The symptoms can range from mild to severe instability that restricts use of the upper limbs, as well as recurring or permanent subluxation or dislocation. These may result in painful elbow locking, clicking, snapping, or clunking [9].

Collateral ligament reconstruction is absolutely necessary if reduction necessitates the release of soft tissues [8]. Palmaris longus, plantaris, and triceps fascia grafts may be used to reconstruct chronic LUCL and MCL injuries with instability [11–13]. Speed (1925) proposed the V–Y plasty technique for triceps lengthening to reduce old elbow dislocations [14]. Many authors throughout the century have used the same method, namely Billet, Naidoo and Fowles et al. [15–17].

Table

Table showing epidemiology & functional improvement according to the Mayo Elbow Performance Index [11]

Patient (case No.)	Age (years)	Gender	Side	Delay (days)	Preoperative mobility	Postoperative mobility	Score
1	25	Male	Left	35	0	100	95 (excellent)
2	36	Female	Right	42	10	120	95 (excellent)
3	42	Male	Left	38	0	80	65 (average)
4	33	Male	Left	24	15	110	95 (excellent)
5	14	Female	Right	64	30	125	95 (excellent)
6	29	Male	Left	79	0	90	80 (good)
7	23	Female	Right	62	20	100	95 (excellent)
8	58	Male	Left	40	40	95	85 (good)
9	27	Female	Right	92	25	75	55 (poor)
10	46	Male	Left	39	30	110	95 (excellent)
11	22	Female	Right	42	40	125	100 (excellent)
12	45	Male	Left	75	15	95	85 (good)
13	39	Male	Right	29	0	110	95 (excellent)
14	32	Male	Left	34	40	90	75 (good)



Fig. 5. Elbow flexion range in last follow up



Fig. 6. Elbow extension range in last follow up



Fig. 7. Elbow Supnation range in last follow up

The basic principles of the procedure include extensive release, V–Y plasty, and K-wire fixation for 2–4 weeks following surgery, followed by vigorous physiotherapy. However, patient needs immobilization for prolong period of time using K-wire or above elbow casts. The sole exception is Arafiles et al., who attempted to reconstruct the intra-articular cruciate ligament utilising the patient's palmaris longus in order to give the patient immediate anterior and posterior stability [5]. By doing so, a K-wire fixation can be avoided and the patients might mobilise early [18]. For our patient, we have substituted triceps tendon fascia for palmaris longus. Collateral ligament and articular cartilage damage was prevented by using proper dissection methods. Early mobilisation is a key goal of collateral ligament reconstruction. Van Riet et al. described a procedure employing a single gracilis tendon, which may be single loop or double loop based on the number of reconstructed bundles of the MCL and LUCL [4]. The circumferential graft approach is mostly described in the literature as a treatment for chronic instability that results from other types of injuries, but to our knowledge, its use for a neglected elbow dislocation has been rarely described. Only open reduction and temporary stabilisation, requires longer-term immobilisation, can result in post-operative instability or stiffness. But with open reduction and cruciate ligament replacement in addition to our method of reconstruction, it enables us to allow ROM early and achieve reasonably good stability and functional improvement (Fig. 5–8).

Conclusion

Neglected elbow dislocations are very common in India. Good functional improvement depends upon the surgical technique & early rehabilitation. In this article, we have described a unique circumferential approach that uses a single circular graft to



Fig. 8. Elbow pronation range in last follow up

rebuild both the lateral and medial ligament complexes which confers very good stability & early rehabilitation is possible that leads to excellent functional outcome.

Acknowledgement. The authors are highly grateful to the Chairman (Prof M. R. Nayak) and the Dean (Prof. (Dr.) Sanghamitra Mishra), IMS & SUM Hospital, Siksha O Anusandhan (Deemed to be University) for providing the necessary facility during the period of study.

Conflict of interest. The authors declare no conflict of interest.

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The article has been sent to the editors 08.06.2024

РЕЗУЛЬТАТИ ЛІКУВАННЯ ЗАСТАРІЛОГО ВИВИХУ ЛІКТЬОВОГО СУГЛОБА З ВИРАЖЕНОЮ НЕСТАБІЛЬНІСТЮ ЗВ'ЯЗОК ШЛЯХОМ АРТРОЗУ В ПОЄДНАННІ З РЕКОНСТРУКЦІЄЮ MCL, LUCL З ВИКОРИСТАННЯМ ФАСЦІЇ СУХОЖИЛКА ТРИГОЛОВОГО М'ЯЗА

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