Case Study

The outcome and complications of interposition arthroplasty using an Achilles tendon allograft in juvenile idiopathic arthritis

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Introduction

Movement at the elbow is essential for several activities of daily living, with a 100° arc of flexion and supination required to feed oneself, lift objects and maintain personal hygiene.[1] This case reports a 23-year-old male with a 10-year history of juvenile idiopathic arthritis (JIA) severely affecting the right elbow.

JIA has an unknown aetiology and is characterised by the onset of arthritis before the age of 16 years.[2] Surgical treatment aims to preserve movement at the elbow and reduce pain associated with the disease. Historically, methods have included total elbow arthroplasty, resection arthroplasty, arthrolysis and arthrodesis, all of which produce suboptimal results in the young and highly mobile patient. More recently, interposition arthroplasty (IA) has emerged as a possible treatment. This procedure is well described by Cheng and Morrey[3] and involves positioning a graft between the ulnar and radial surfaces of the elbow joint in order to reduce friction between the articulating surfaces and improve movement at the joint.

IA is often considered a salvage procedure, as it neither restores full function nor completely eliminates pain, but has been shown to improve patients' symptoms, increase range of movement at the joint and prolong the need for total elbow arthroplasty (TEA).[4] This procedure does not carry the same weight-bearing restrictions as TEA, thus is considered a more suitable procedure for younger patients. The graft is expected to resorb and the joint space to vanish over time; however, preservation of bone means that if IA fails, TEA can be easily and safely implemented when needed.[5]

Case presentation

The 23-year-old male patient complained of severe pain and restricted movement in the right elbow. On examination, the patient was held in fixed flexion with only 15° of flexion and 30° of supination. The elbow was erythematous and swollen with crepitus on palpation. There was no family history of inflammatory arthritis or other rheumatological conditions and the patient had no other relevant past medical history. The patient had adapted to become left-arm dominant; however, pain of movement severely restricted both work and social life.

Treatment

At the time of the report, the patient was receiving tocilizumab infusions of 4mg/kg, which had been ongoing for the past year, after failing to respond to methotrexate and azathioprine. Previous surgeries included a right elbow arthrolysis, right radial head excision and ulnar nerve transposition, which were all carried out in a single procedure in 2018 and had little effect in relieving the patient's symptoms. Despite initially responding well to tocilizumab, the patient subsequently complained of increasing pain and reduced mobility of the right elbow 6 months after commencing the treatment, requiring pain management with daily ibuprofen and codeine. At this point, the benefits and disadvantages of TEA vs IA were discussed with the patient leading to a patient-led decision to proceed with IA.

Outcome and follow-up

Four weeks post IA, the patient was reviewed in clinic as relatively comfortable post surgery, no intra- or post-operative complications were reported and the patient was managing with simple analgesia alone (paracetamol and ibuprofen). On examination the posterior scar was well healed with no signs of infection and pin sites of the external fixator were secure, clean and dry. Motor and sensory function of the radial, ulnar and median nerves were intact, and the elbow joint was congruent and nicely detached.

Discussion

The outcome and post-operative complications of IA are still poorly understood, probably owing to the limited number of documented cases to date. Studies so far have categorised patient satisfaction and outcome of surgery according to the Mayo Elbow Performance Score (MEPS). This assigns a maximum of 100 points according to pain, motion, stability and daily function.[6]

A study analysing the outcomes of 38 elbow IA procedures showed a mean overall increase in MEPS of 41 to 65, with 50% of patients rating the elbow as significantly better following surgery, 32% as moderately better, 13% as the same and only 5% as worse.[4] This study concluded that patient satisfaction is most likely due to the increase in functional ability and mobility obtained after the procedure, as pain and elbow stability showed modest, if any, improvement.[4]

Other studies have shown that up to 31% of patients had unsatisfactory results following surgery, and 18% of cases actually failed due to the severity of elbow instability, requiring conversion to TEA.[7] The largest study of IA to date produced similar results, with 29% of patients reporting significant elbow instability.[4] This is believed to be reduced by the application of a dynamic external fixator, which allows tissues to heal whilst maintaining support and promoting mobility. However, the clinical outcome of patients managed with and without external fixation is debatable, suggesting the need for a more reliable method to reduce post-operative instability.

Other post-operative complications include nerve injury, with the most frequently documented cases involving the ulnar nerve, and more rarely the radial or median nerves.[8] Anterior transposition of the ulnar nerve during the surgical procedure has been shown to reduce rates of nerve injury; however, most cases of nerve pain prior to surgery will not be resolved following IA.[8]

Wear rate of the graft is also a consideration, with studies showing an average of a 10-year wear rate for fascia lata grafts.[9] Evidence suggests that Achilles tendon grafts are able to resist longer, which is evidenced in lower revision rates when using these grafts (16%) compared with tendon fascia lata grafts (31%).[4]

The "placebo effect" of orthopaedic surgery may also be a contributing factor to consider in cases such as this. Patients' expectation that invasive procedures will correct the underlying pathology often results in improvement of symptoms, such as pain and dysfunction, based on the biomedical health model of pain.[10] A study into "sham procedures", whereby no surgical intervention was carried out, revealed similar patient-reported outcomes to the comparison group of patients who received surgical intervention.[11]

Whilst a single review can be biased, a case report is a useful way to understand the impact of a disease and intervention on a patient. Patient discussions can often be illuminating as to the important factors in determining the acceptability and success of surgery.

Conclusion Overall, IA appears a viable option for young and active patients, in whom TEA yields undesired results, such as limited range of movement and functionality. IA scores high in patient satisfaction for mobility and range of movement after surgery and can be easily converted to a TEA in the future should the graft fail, making it a suitable pre-prosthetic alternative. Post-operative elbow instability appears to be the most significant complication of IA. With so few cases documented to date, analysis of the procedure outcome remains challenging yet promising.

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References

1. Morrey BF, Askew LJ, Chao EY. A biomechanical study of normal functional elbow motion. *J Bone Joint Surg Am*, 1981; 63(6):872–877.
2. Hahn YS, Kim JG. Pathogenesis and clinical manifestation of juvenile rheumatoid arthritis. *Korean J Paediatric*, 2010; 53(11): 921-930.
3. Cheng SL, Morrey BF. Treatment of the mobile, painful arthritic elbow by distraction interposition arthroplasty. *J Bone Joint Surg Br*, 2000; 82:233–238.
4. Larson AN, Morrey BF. Interposition arthroplasty with an Achilles tendon allograft as a salvage procedure for the elbow. *J Bone Joint Surg Am*, 2008; 90:2714–2723.
5. Blaine TA, Adams R, Morrey BF. Total elbow arthroplasty after interposition arthroplasty for elbow arthritis. *J Bone Joint Surg Am*, 2005; 87:286–292.
6. Journal of Orthopaedic Trauma. Mayo elbow performance score, *Journal of Orthopaedic Trauma*, 2006; 20(8):S127.
7. Nolla J, Ring D, Lozano-Calderon S, et al. Interposition arthroplasty of the elbow with hinged external fixation for post traumatic arthritis. *J Shoulder Elbow Surg*, 2008; 17:459–464.
8. Morrey BF. Distraction arthroplasty. *Clin Orthop Relat Res*, 1993; (293):46–54
9. Ersen A, Demirhan M, Atalar AC, et al. Stiff elbow: distraction interposition arthroplasty with an Achilles tendon allograft. *Acta Orthop Traumatol Turc*, 2014; 48(5):558–562.
10. Weiner BK. Spine update: the biopsychosocial model and spine care. *Spine* 2008; 33:219–223.
11. Louw A, Diener I, Fernández-de-Las-Peñas C, et al. Sham surgery in orthopaedics: a systematic review of the literature. *Pain Medicine*, 2017; 18:736–750.