Treatment of Pediatric Displaced Intraarticular Olecranon Fractures with Resorbable Poly-L-Lactic-Co-Glycolic Acid (PLGA) Pins and Polydioxanone (PDS) Loops.

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Introduction

Pediatric olecranon fractures, which involve a break in the bony prominence of the elbow, are relatively rare but can be serious. Treatment options typically depend on the type and severity of the fracture. Displaced, intraarticular fractures require surgical intervention, where resorbable implants are becoming a promising alternative to traditional metal hardware.

Methods

Between Jan 2022 and January 2023, the Division of Surgery, Traumatology, Urology, and Otorhinolaryngology, Department of Pediatrics at the University of Pécs, Clinical Complex was involved in the consecutive treatment of three pediatric patients with olecranon fractures utilizing PLGA pin implants (Activa PIN™, Bioretec Ltd., Tampere, Finland) and PDS loops (Ethicon, Johnson & Johnson. This case series involves three patients. The surgical technique was almost identical to the traditional method, with one additional step. In a supine position under general anesthesia, an open approach was made, and after accurate reduction, the fracture was temporarily stabilized with K-wires. These wires were then replaced with bioabsorbable pins. Compression was ensured by a PDS loop placed in a drilled canal distal to the fracture.

Objectives

Our single-center, prospective case series aims to present adolescent olecranon fracture treatment with resorbable implants and evaluate the one-year follow-ups of the result of this method.

Case 1.

A 12-year-old boy sustained an injury. A Mayo type II/B olecranon fracture with joint step formation was confirmed by X-rays (Figure 1(A-B)). After preparation, the fracture was reduced and stabilized with absorbable PLGA pins and a PDS loop. The follow-up X-ray showed the fracture in good alignment (Figure 1(C-D)). For three weeks, the left upper limb was restrained in a long arm cast. One-year follow-up radiographs confirmed finished fracture healing, with full elbow joint function (Figure 1(E-F)).

Figure 1. Initial X-rays of the right olecranon fracture (AP (A), lateral(B)), and the postoperative radiographs show acceptable articular congruency (AP(C), lateral (D)). One year later the X-ray images (AP (E), lateral (F)) depict good alignment and perfect articular congruency.

Case 3.

While cycling, a 12-year-old boy injured his left elbow. Initial X-rays confirmed a Mayo type II/A olecranon fracture (Figure 3(A)). Due to the formation of joint steps, surgical intervention was necessary. Throughout the open approach, the fracture was reduced to an anatomical position and temporarily fixed with two K-wires (Figure 3(B)). After the removal of the K-wires, the absorbable PLGA pins were placed into the cavity previously created by the wires. Subsequently, compression was achieved by PDS loops placed in a drilled canal distal to the fracture to ensure proper stability (Figure 3(D)). A right-angle dorsal cast was employed to immobilize the left upper limb for three weeks, followed by active physiotherapy treatment.

Figure 3. Primary X-ray of an olecranon fracture from lateral view (A). Fluoroscopic images after open reduction and temporary K-wire fixation (B-C). Intraoperative photograph showing the two parallel resorbable pins and a PDS compression loop (D). Postoperative X-rays demonstrate good alignment and perfect articular congruency from lateral (E) and AP (F) aspects.

Case 2.

A 13-year-old boy injured his right elbow while cycling. He presented with significant swelling and restricted ROM. X-rays confirmed a comminuted Mayo type II/A olecranon fracture with joint involvement (Figure 2(A-B)). During open surgery, after achieving the most accurate reduction, the fracture was stabilized with absorbable implants (PLGA pins and a PDS loop) (Figure 2(C-D)).

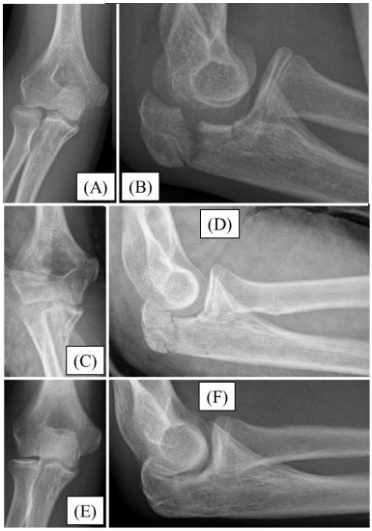

Figure 2. Preoperative X-rays from AP (A) and lateral (B) aspects of olecranon fracture. Postoperative X-rays show good reduction and perfect articular congruency AP (C) and lateral (D). One year later, the fracture was entirely healed with no sign of articular incongruency (E-F).

Conclusion

Management of pediatric olecranon fractures requires careful consideration of both immediate fracture stabilization and long-term outcomes. Bioresorbable PLGA implants and PDS loops represent a promising approach, offering the benefit of elimi-nating the need for removal surgery, which is a significant advantage in a growing child by reducing anesthetic and imaging radiation dosages, discomfort, hospitaliza-tion length, and financial burden related to an additional operation. However, their use must be weighed against concerns related to, strength, resorption rates, high initial costs, and surgical expertise required due to visualization difficulties. Ultimately, a personalized treatment plan that considers the individual needs of the child, the na-ture of the fracture, and the available resources will ensure the best outcomes for these patients.

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