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Case Report

A pediatric forearm fracture case with delayed union, re-fracture, and COVID-19 pandemics-related surgical delay

Gecikmiş kaynama, yeniden kırılma ve COVID-19 pandemisine bağlı cerrahi gecikme olan bir pediatrik önkol kırığı olgusu

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ABSTRACT

While several complications are described after intramedullary fixation using Titanium Elastic Nails (TEN) for pediatric forearm fractures, delayed union rates are reported to be around 4%. A 12-year-old patient, who underwent TEN after a forearm fracture, was recommended to have a secondary surgery due to nonunion at the ulna after 16 weeks of follow-up. Unfortunately, the existing callus formation was lost after the patient received a second blow during the preoperative preparation process. Moreover, the family refused the operation because of the fear of the COVID-19 pandemic. The patient's family gave consent after 35 weeks, and the patient was taken under the operation. The complete union was achieved with a full range of motion after 6 months of follow-up. In conclusion, in pediatric forearm fractures, one should be careful about the delayed union, carry out close follow-up and thorough evaluation, and secondary surgery should not be avoided when necessary.

Keywords: COVID-19 pandemics, delayed union, Pediatric forearm fracture, re-fracture, TEN complications

ÖZ

Pediatrik önkol kırıklarında intramedüller Titanyum Elastik Çivileme (TEÇ) sonrası fiksasyon sonrası çeşitli komplikasyonlar tarif edilirken, gecikmeli kaynama oranları %4 civarında bildirilmektedir. Olgumuzda önkol kırığı sonrası TEÇ uygulanan 12 yaşındaki hastaya 16 haftalık takip sonunda ulnada kaynama yetersizliği nedeniyle sekonder cerrahi önerildi. Maalesef ameliyat öncesi hazırlık sürecinde hasta ikinci bir darbe aldıktan sonra mevcut kallus oluşumu kayboldu. Ayrıca aile pandemi korkusuyla operasyonu reddetti. Hastanın ailesi 35 hafta sonra operasyona onam verdi ve hasta ameliyat edildi. Altı aylık takip sonunda tam hareket açıklığı ile tam kaynama sağlandı. Sonuç olarak, çocuk önkol kırıklarında kaynama gecikmesi açısından dikkatli olunmalı, yakın takip ve dikkatli değerlendirme yapılmalı, gerektiğinde ikincil cerrahi müdahaleden kaçınılmamalıdır.

Anahtar kelimeler: Pediatrik önkol kırığı, kaynama gecikmesi, yeniden kırık, TEN komplikasyonları, COVID-19 pandemisi

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INTRODUCTION

Pediatric forearm fractures, which are associated with falling and open hand injuries, are among the most common pediatric fractures (1-3). Closed reduction and long-arm casting are the first lines of treatment, but if the acceptable reduction described in the literature cannot be achieved, surgery is indicated. Considering the minimally invasive technique, minimal periosteal damage, and similar union rates, intramedullary fixation using Titanium Elastic Nails (TEN) are the primary surgical option when surgery is indicated (2,3). While several complications are such as infection or compartment syndrome with a complication rate of up to 21%, described after intramedullary fixation using TEN in the literature, delayed union rates reported in the literature are around 4% (3,4).

Herein, we report a case of a pediatric forearm fracture, who experienced delayed union, re-fracture, and delayed secondary surgery due to the COVID-19 pandemic.

CASE REPORT

The patient and his legal representatives were informed that data from the case would be submitted for publication and gave their consent. A 12-year-old male patient, with no history of comorbidities, presented with forearm pain and angulation on his right upper extremity after a school fight. After clinical and radiological evaluations, both bone forearm fracture was diagnosed. Considering the patient's age and reduction quality, surgical treatment was deemed appropriate and intramedullary fixation using TEN was performed on both the radius and ulna in November 2019 (Figure 1). During the surgery, closed reduction was attempted for both bones under general anesthesia. While anatomical reduction can be achieved in the radius via closed methods; since anatomical reduction could not be achieved in the ulna, open reduction was preferred. When the ulnar fracture site was opened, soft tissue and muscle were seen between distal and proximal fracture fragments. Those were removed from the fracture site, the anatomical reduction was achieved and then TEN was applied.

After 16 weeks of regular follow-up and removal of nails from both bones, as recommended in the literature, the complete union was observed in the

Figure 1. The forearm double fracture of the 12-year-old male patient was treated with TEN, as the acceptable reduction was not achieved with closed reduction. Radius was reduced through closed methods under general anesthesia, whereas open reduction was used for the ulna.

Figure 2. After 16 weeks of follow-up and removal of nails, the complete union was observed in the radius but not in the ulna, thus a second surgery was recommended.

Figure 3. 35 weeks after the first operation and 19 weeks after the second school fight, there was still no union in the ulna and the second operation was performed.

radius, but not in the ulna; and secondary surgery was planned (Figure 2). Unfortunately, during the pre-operative preparation, the patient received a second blow to the same arm in a fight at school, and a re-fracture occurred, losing the existing union tissue of the ulna. Moreover, on March 11, 2020, after COVID-19 was declared a pandemic all over the world and cases began to be seen in Turkey, the family refused the second surgery and hospitalization due to the fear of infection.

As the number of COVID-19 cases in Turkey started to decrease, the family approved the second surgery in July 2020 and the patient underwent open reduction, autografting and plate-screw fixation for the ulna on the 35th postoperative week after the first operation (Figure 3 and 4). Autograft which was taken from the iliac bone was preferred for grafting and compression was applied to the fracture site through low contact dynamic compression plating. After appropriate postoperative rehabilitation and adequate follow-ups, in January 2021, complete union, both radiologically and clinically was obtained and a painless full range of motion was achieved (Figure 5). After the complete union was observed, implant removal was performed in September 2021 (Figure 6). On the last control, the patient has a full range of motion with no complaints.

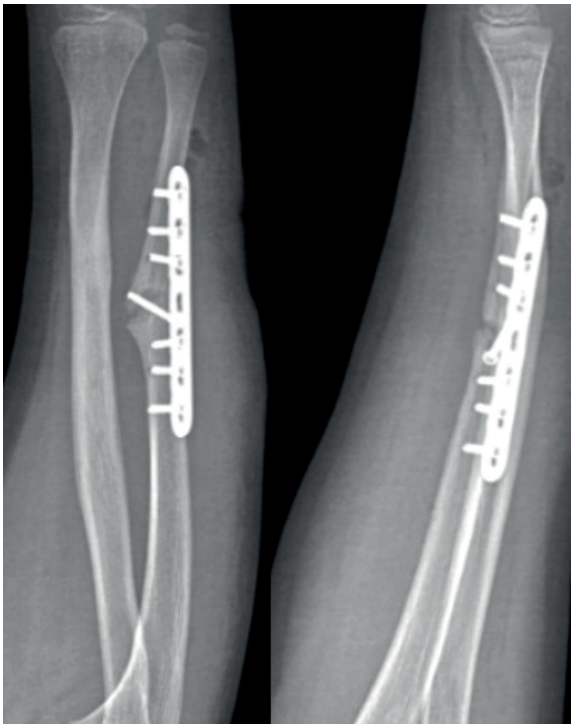

Figure 4. Autografting and low contact dynamic compression plating were applied to the ulna.

Figure 5. After 6 months of follow-up after the second surgery, complete union with a full range of motion was achieved.

Figure 6. Implant removal was performed 14 months later after the second surgery, and the patient reported no complaints with a full range of motion on the last follow-up.

DISCUSSION

Midshaft fractures of both bones on the forearm make up nearly 15 to 18% of pediatric forearm fractures and nearly 50% of these are greenstick fractures (5). Mostly these patients are treated with closed reduction and long-arm casting. However, over time, indications of these fractures change, and the popularity of surgical treatments is increasing (2,3). Titanium elastic nailing, which has similar fracture healing results with open reduction and plating, is widely used and has advantages such as being a more biological technique, eliminating the need to open the fracture line, and protecting the fracture hematoma, which is very important for healing (2,3). On the other hand, many complications such as wound closure problems, skin irritation, skin infection, deep wound infection, osteomyelitis, and neurovascular injury can be seen due to surgical intervention. In addition, joint stiffness, hypertrophic osteodystrophy,

malunion, synostosis, delayed union, nonunion, and re-fractures can be seen mostly depending on the fracture healing process (3,4,6). While union problems (delayed or nonunion) are rare in children, refractures are more common than in the normal population. The reason for this is uncontrolled physical activity is common especially in school-age children. Tisosky et al.[6] reported the refracture rate after forearm fractures in children as 14 per thousand. In our case, we encountered both a rare delayed union and development of refracture due to the fact that the patient had two fights at school at an interval of 16 weeks.

After the first operation, during the routine follow-up, direct radiography controls and physical exam of the patient showed hints of delayed union of the ulna. We assumed that open reduction during the surgery may have increased the risk of delayed union through compromised blood circulation, disrupting the first steps of bone healing. Therefore, we recommended a second surgery using plate and grafting. Fernandez et al.[7] also stated that among all the treated pediatric both bone forearm fractures with TEN, the delayed union was observed in six patients and all six patients with the delayed union had open reduced midshaft ulna fractures. Also, delayed union after TEN may be related to the lack of compression on the fracture line and minimal support on rotational stability compared to the plating technique (8). Indeed, we achieved complete union following optimal compression and stability with the plate in the second surgery. However, optimal stability can also be obtained through TEN in non-comminuted fractures, according to several authors (9).

In conclusion, although rare, a delayed union is a problem that can also be encountered in pediatric fractures. Close follow-up and careful evaluation should be carried out, and secondary surgical interventions should not be avoided when necessary.

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