

# Removal of internal fixation in pediatric patients

*Adnan G. Alzahrani, MD, JBOS, Yaser M. Behairy, MD, FRCSC, Mohammad H. Alhossan, MD, FACHARTZ, Faisal S. Arab, MD, FACHARTZ, Abdulaziz A. Alammari, MD, FRCSC.*

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## ABSTRACT

**Objectives:** Internal fixation devices are commonly used in the surgical treatment of many orthopedic conditions. Their prolonged presence, however, has been associated with potential complications. Many surgeons advocate the routine removal of internal fixation in the pediatric age group. In this report we present our experience with removal of internal fixation in pediatric patients and evaluate the benefits and difficulties of doing so.

**Methods:** A retrospective analysis of 304 pediatric patients who underwent removal of internal fixation implants for various indications at the Armed Forces Hospital, Riyadh, Kingdom of Saudi Arabia between January 1985 and December 1999, was carried out.

**Results:** A total of 176 males and 128 females were

included. Their mean age at time of removal of internal fixation was 11 years (range 2-18). The fixation device was removed at an average of 16.3 months (range 10-40) after implantation. One hundred and twenty (39.5%) patients had the initial fixation for the treatment of fractures. For all 304 patients, late removal of the implant was found to be more difficult than early removal. Implants around the hip and pelvis were more difficult to remove than other locations.

**Conclusion:** Our experience supports the indication for timely removal of internal fixation devices in the pediatric population. When carried out on a routine basis it can avoid the difficulties associated with the late removal of implants.

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**I**nternal fixation is commonly used in the surgical treatment of many orthopedic conditions.<sup>1</sup> Most internal fixation devices serve a temporary role of holding and supporting the tissues until healing is achieved. After that, the implant usually has no function and can act as a foreign body with potential complications such as delayed infection, implant migration, implant breakage, allergic reactions, stress fractures and soft tissue irritation.<sup>2-6</sup> These potential complications led many surgeons to routinely remove internal fixation devices in the pediatric population. In this report we present our experience with removal of internal fixation devices in the pediatric population and evaluate the benefits and difficulties of doing so.

**Methods.** This was a retrospective analysis of 304 pediatric patients who underwent removal of internal fixation implants at the Armed Forces Hospital, Riyadh, Kingdom of Saudi Arabia between January 1985 and December 1999. Medical records were examined for demographic data, indication for original fixation, post-operative follow-up, and any complications related to the presence of the internal fixation device. Radiographs were examined for progression of healing after the initial fixation and any evidence of hardware related complications. The indication for removal of internal fixation was identified in each patient as well as the healing status of the bone at time of removal. Data on operative time and blood loss at time of removal was also obtained.

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From the Department of Surgery (Alzahrani, Alhossan, Arab), Armed Forces Hospital and the Department of Surgery (Behairy, Alammari), King Fahad National Guard Hospital, Riyadh, *Kingdom of Saudi Arabia*.

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Address correspondence and reprint request to: Dr. Yaser Behairy, PO Box 53118, Riyadh 11583, *Kingdom of Saudi Arabia*. Tel. +966 (1) 2520088 Ext. 4119. Fax. +966 (1) 2520088 Ext. 4138. E-mail: ybehairy@yahoo.com

**Results.** A total of 304 patients were included in this study, 176 males and 128 females. Their main age at time of removal of fixation was 11 years (range 2-18). The internal fixation was originally used for the treatment of fractures in 120 (39.5%) patients, developmental dislocation of the hip in 98 (32%), slipped capital femoral epiphysis in 24 (8%), avascular necrosis of the femoral head in 21 (7%), Perthes' disease in 17 (6.5%), poliomyelitis in 14 (4.5%), and congenital anomalies in 10 (3.5%). The fixation was removed at an average of 16.3 months (range 10-40) after implantation. In 25% of the cases, the fixation was removed within a year after implantation, and in 7% of the cases, it was removed more than 3 years after implantation. The indications for removal of internal fixation in these patients was uncomplicated healing of a fracture or osteotomy in 188 patients (62%), infection in 34 (11%), painful irritation in 31 (10%), migration of implant in 29 (9.5%), failure of fixation in 12 (4%), and malunion in 10 (3.5%). All of the migrated implants were around the hip joint and all needed re-fixation. Failure of fixation was the indication in 12 (4%) patients, all of which needed re-fixation. The implants removed were plates and screws in 140 patients (46%), pins in 110 patients (36%), screws alone in 33 patients (11%), and intramedullary devices in 21 patients (7%). The implants were removed from the hip and proximal femur in 79 patients (42%), femoral shaft and distal femur in 39 patients (21%), tibia in 22 patients (12%), humerus in 19 patients (10%), ileum in 11 patients (5%), knee in 7 patients (4%), and foot in 3 patients (2%). The intra-operative blood loss at time of removal was less than 200 ml in 283 (93%) patients. The remaining 7% had more than 200 ml blood loss, a mean age of 16 years and all operations around the hip with no tourniquet. The operative time for implant removal was less than 60 minutes in 237 (78%) patients and more than 60 minutes in the remaining 67 patients. The group with more than 60 minutes surgical time had their operations around the hip and all of them had plate and screw removals more than 3 years after original fixation, with abundant callus around the implant as seen on pre-operative radiographs and intra-operative findings. Blood loss and time of surgery was significantly higher in the group who had removal of fixation 3 (p=0.026) or more years (p=0.027) after original fixation. There was no statistically significant difference in the indication for implant removal based on location. There was no significant difference between patients who had removal of implant after healing of a fracture or osteotomy and those who had removal for other reasons in terms of age, sex,

original diagnosis, type of implant, blood loss and operative time. Complications included inability to remove the implant completely in 28 patients. All those were around the hip, 18 were pins after slipped capital femoral epiphysis and 10 were plate and screws after femoral osteotomy. Other complications include refracture after removal of plate and screws in 7 patients.

**Discussion.** Several authors have recommended removal of internal fixation devices in the pediatric population. When it is carried out in a timely fashion, it can avoid many of the potential complications associated with the presence of hardware, such as delayed infection, hardware migration, implant breakage, allergic reactions, stress fractures and soft tissue irritation. Young patients tend to heal quickly and often an abundant callus is formed that may lead to difficulty when hardware removal is delayed. Swinntkowski<sup>6</sup> reported on 18 cases of pin removal from the hip after treatment of slipped capital epiphysis. In these patients, there was more blood loss and more surgery time required than the initial procedure. Pin fracture has occurred in 61% and infection 11%. In a review of 63 osteotomies around the hip, Highland and Lamont<sup>3</sup> reported 6 cases of deep infection 7-24 months after fixation. They strongly advise implant removal as soon as there is radiological evidence of healing. They found no association between occurrence of infection and the type of implant, location, sex or diagnosis.

In conclusion, our experience is similar to that in the literature and supports the recommendation for early removal of internal fixation devices in the pediatric population.

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