



Excessive Thumb Motion Causing Delayed Tendon Injury to Wrist First Extensor Compartment Associated with Flexible Nail

**Bisher Alshanawani¹, Abdulmonem Mohammed Alsiddiky², Feras Alshomer^{3*}
and Mohamed Zamzam⁴**

¹*King Saud University / College of Medicine, King Khalid University Hospital, Plastic and Reconstructive Surgery Unit, Riyadh, Saudi Arabia.*

²*King Saud University / College of Medicine, King Khalid University Hospital, Department of Orthopedic Surgery, Riyadh, Saudi Arabia.*

³*King Saud University / College of Medicine, King Khalid University Hospital, Plastic and Reconstructive Surgery Resident, Riyadh, Saudi Arabia.*

⁴*King Saud University / College of Medicine, King Khalid University Hospital, Pediatric and Orthopedic Surgeon, Department of Orthopedic Surgery, Riyadh, Saudi Arabia.*

Authors' contributions

This work was carried out in collaboration between all authors. Author FA wrote the draft of the manuscript. Author BA managed the literature searches. Author AMA designed the figures, managed literature searches and contributed to the correction of the draft. Author MZ provided the case, the figures and supervised the work. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJMPGCR/2015/13583

Editor(s):

(1) Suhail Rasool, Neurosciences Research Center, JFK Medical Center, 65 James street Edison New jersey, USA.

Reviewers:

(1) Medhat Emil Habib, Department of Plastic, Reconstructive and Craniofacial Surgery, Mafraq Hospital, Abu Dhabi, UAE.

(2) Anonymous, Toronto Western Hospital, Canada.

(3) Hua Lu, Dept. of Orthopaedics, Xinhua Hospital affiliated to Shanghai Jiaotong University School of Medicine, China.

Complete Peer review History: <http://www.sciedomain.org/review-history.php?iid=705&id=38&aid=6585>

Case Study

**Received 24th August 2014
Accepted 5th October 2014
Published 22nd October 2014**

ABSTRACT

Aim: To withdraw the attention to the possible complication of tendons rupture in cases of intramedullary flexible nail fixating cases of pediatric both bone forearm fractures.

Presentation of Case: A 16 years old boy with a history of right forearm both bones mid shaft fracture was managed with closed reduction and flexible intra-medullary nail fixation. The patient

*Corresponding author: E-mail: Dr.fshomer@gmail.com;

was doing fine but, four months later he sustained sharp pain that was associated with limitation of thumb motions while using a video game controller. Surgical exploration revealed rupture of Extensor Pollicis Brevis (EPB) and attrition of Abductor Pollicis Longus (APL) tendons by rubbing over the free bent end of the flexible nail. This complication was managed satisfactorily.

Discussion: The authors are reporting this case for the treating physicians to be aware about such complication, which should be avoided. Elaborating for the first time a presumed causal association between daily thumb motion and risk of injury that should be kept in mind while treating such cases to prevent possible complication.

Conclusion: Treating mid-shaft radial fracture in children with flexible nails is subjected to this possible complication. The free end of the flexible nail must be away from the excursion of any of wrist tendons. Changes in lifestyle habits that result in excessive motion of the involved joint should be avoided. A multidisciplinary team approach is essential in the management plan.

Keywords: Attrition; extensor; forearm; nail; rupture.

1. INTRODUCTION

Mid-shaft fractures of radius and ulna account for 6% to 10% of all pediatrics' fractures [1]. Achieving acceptable alignment by closed reduction and cast immobilization should be attempted first [2]. Unstable fractures or failure of closed reduction are indications for surgical treatment [3].

The options of surgical fixation include flexible intra-medullary nail and open plate fixation [1].

Although intra-medullary flexible nail provides less invasive procedure and maintains the acceptable alignment with short operation time and good functional outcome, the procedure is not immune from complications [3,4]. The reported complications include: pain owing to nail protrusion, skin erosion, superficial infection, transient neuropraxia due to involvement of superficial branch of radial nerve, [5] and wrist extensor tendons injury [6].

Hereby, we are reporting an uncommon late complication of intra-medullary fixation for fracture both bones forearm in teenager that was associated with a habit of excessive thumb use, in an attempt to alert the treating physicians about this possible complication of such technique accounting for the every now and then changes in the population's lifestyle.

2. PRESENTATION OF CASE

16 years old male patient sustained closed mid-shaft fracture of right radius and ulna after a fall during football match. The patient presented to the Accident and Emergency department at King Khalid University Hospital at King Saud University in which he was further managed. On

examination, there were no neurovascular deficits, skin wounds or other skeletal injuries. The patient was admitted in orthopedic ward and on the same day he was taken to the operating room, where closed reduction and flexible intra-medullary nail fixation (Nancy nail) through minimal skin incision was done for both radial and ulnar fractures. Fixation of the ulna was achieved first by ante-grade nailing through proximal entry. Then, the radius was stabilized via a retrograde physeal-sparing nailing through distal lateral approach at the floor of the first dorsal compartment after identifying and protecting the superficial radial nerve and the tendons of the first dorsal compartment. The bent free ends of both nails were buried flush to the bones before skin closure.

Post operative check x-rays were satisfactory and the patient was discharged next day after surgery. Wound inspection was performed after two weeks. Back slab was discontinued after four weeks when pain free range of motion was started. The patient regained his full range of motion after ten weeks, when check x-rays showed union of the fracture with excellent bone alignment Fig. 1.

Four months later and during regular follow up, the patient complained of sudden sharp pain since two weeks in his right thumb radiating proximally to the wrist. The pain started while the patient was playing video game using a hand-held controller and it was sever to an extent that he couldn't complete the game. On examination, there were extension lag at metacarpophalangeal (MCP) joint and limited abduction of the affected thumb Fig. 2.

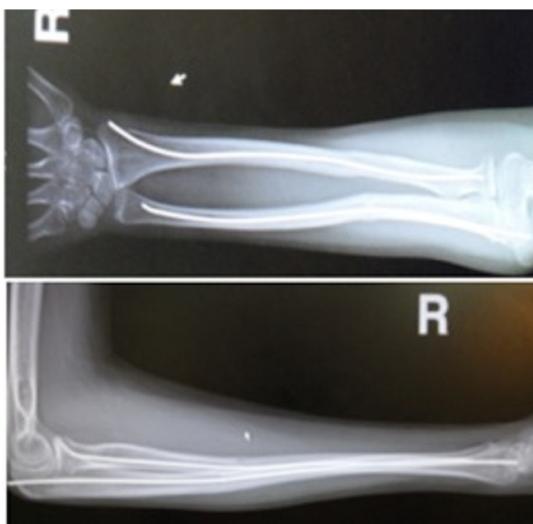


Fig. 1. Anteroposterior X-ray (Top) and lateral view (bottom) shows radiological union of the fracture



Fig. 2. Extension lag at Metacarpophalangeal (MCP) joint of the right thumb during the physical examination

No sensory loss was noticed. Radiographic examination of the right hand was normal.

Provisional diagnosis was made as tendon injury of the first wrist extensor compartment especially the EPB tendon. Patient was admitted for exploration and possible tendon repair. Both flexible intra-medullary nails were removed first, and then exploration revealed rupture EPB tendon and attritional injury to APL tendon together with adhesions of both tendons at the level of the bent free end of the radial nail Fig. 3.

Adhesions around the level of the injured tendons were released and followed by primary repair of EPB tendon together with release of adhesion in APL (without the need for tendon

graft). Thumb Spica cast was applied for 6 weeks and subsequently a physiotherapy rehabilitation program was commenced. At the final follow up, the wound had healed without complication and the patient had excellent functional outcome with full thumb movements. A Written, explained and informed consent was obtained from the patient's parent for the purpose of publication of this Case report and any accompanying photographs.

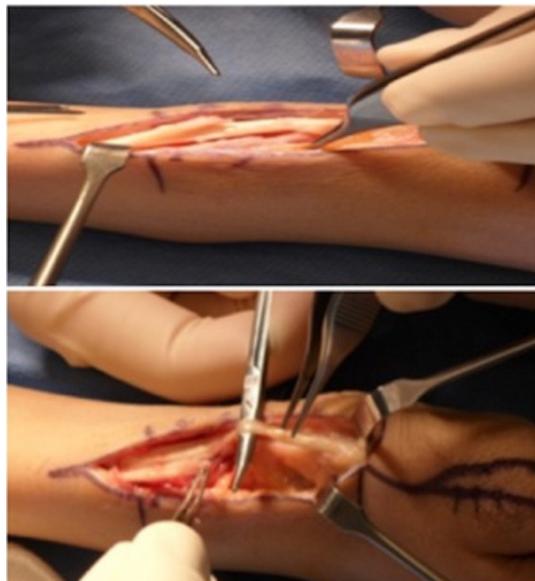


Fig. 3. The intra-operative exploration. The pattern of injury of the wrist extensor compartment around the radial entry point is elaborated in which rupture of Extensor Pollicis Brevis (top) and attrition of Abductor Pollicis Longus tendons (bottom)

3. DISCUSSION

Surgical fixation provides the best management of unstable Mid-shaft fracture of radius and ulna in children [7]. Flexible Intra-mdeullary nail is the preferred method of fixation since it offers small scar, less minimal soft tissue damage, short surgical time and good functional outcome compared to plate fixation [8].

Playing video games with controller requires repeated thumb movements particularly extension and abduction. In the reported case, the protruding free end of the flexible intra-medullary nail irritated the tendons of the first dorsal compartment frequently during continuous motion of the thumb while using the controller to an extent that caused rupture of these tendons.

The use of such controllers have been linked previously to various forms of pathologies that ranged for instance from basal thumb bone fracture to thumb volar plate injuries [9,10].

The involvement of the first wrist extensor compartment tendons as a complication of flexible intra-medullary nail fixation of mid-shaft fracture radius and ulna in children has been rarely reported in the literature. A reported case of partial rupture of Extensor Pollicis Brevis tendon was mentioned in which it was identified at the time of nail removal and was primarily repaired in the same sitting [11].

On the other hand, few reported cases addressed the involvement of Extensor Pollicis Longus tendon attrition or rupture in relation to flexible intra-medullary nail fixation of mid-shaft fracture radius and ulna in particular that presented with difficulty in using the thumb with limited extension of the involved thumb [6,11,12].

The management options that were applied to repair the injured Extensor Pollicis Longus tendon varied from primary repair, tendon graft with the usage of Palmaris Longus tendon as an interposition graft, and tendon transfer with the use of Extensor Indicis Proprius tendon as means of tendon reconstruction with good outcome [11-13].

4. CONCLUSION

According to the knowledge of the authors, the current report is the first that nominated a specific mechanism of delayed rupture and injury of EPB with attrition of APL after flexible intramedullary nail fixation for mid shaft both bones fracture in children. This reported complication beside the others mentioned earlier should arouse treating physicians that although the use of intra-medullary flexible nail is relatively easy, but not complication free. Close patient follow ups with clear post operative instructions that include avoidance of excessive finger motion might aid in the prevention and early diagnosis of possible complications. A multidisciplinary team involving Orthopedic, Plastic and Reconstructive surgeons and Physiotherapist should all be involved to assure the best clinical and functional outcome.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved

parties) for publication of this case report and accompanying images.

ETHICAL APPROVAL

Not applicable.

ACKNOWLEDGMENTS

College of Medicine Research Center, Deanship of Scientific Research, King Saud University, Riyadh, Saudi Arabia.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Yalçinkaya M, Doğan A, Ozkaya U, Sökücü S, Uzümçügil O, and Kabukçuoğlu Y. Clinical results of intramedullary nailing following closed or mini open reduction in pediatric unstable diaphyseal forearm fractures. *Acta Orthop Traumatol Turc.* 2010;44(1):7-13.
2. Shah AS, Lesniak BP, Wolter TD, Caird MS, Farley FA, and Vander Have KL. Stabilization of adolescent both-bone forearm fractures: A comparison of intramedullary nailing versus open reduction and internal fixation. *J Orthop Trauma.* 2010;24(7):440-7.
3. Smith VA, Goodman HJ, Strongwater A, Smith B. Treatment of pediatric both-bone forearm fractures: a comparison of operative techniques. *J Pediatr Orthop.* 2005;25(3):309-13.
4. Fernandez FF, Langendörfer M, Wirth T, Eberhardt O. Failures and complications in intramedullary nailing of children's forearm fractures. *J Child Orthop.* 2010;4(2):159–167.
5. Ali AM, Abdelaziz M, El-Lakanney MR. Intramedullary nailing for diaphyseal forearm fractures in children after failed conservative treatment. *J Orthop Surg (Hong Kong).* 2010;18(3):328-31.
6. Ellapparadja P, Hashmat I, Takwale V. Extensor pollicis longus tendon rupture secondary to elastic intramedullary nailing of paediatric forearm fractures: How to avoid them? *Eur J Orthop Surg Traumatol.* 2011;21(5):315-319.

7. Barry M, Paterson J. Flexible intramedullary nails for fractures in children. *J Bone Joint Surg Br.* 2004;86:947-953.
8. Pugh DM, Galpin RD, Carey TP. Intramedullary Steinmann pin fixation of forearm fractures in children. Long-term results. *Clin Orthop Relat Res.* 2000;(376):39-48.
9. Mandal A, Imran D, Erdmann M. Prolonged use of electronic games-a word of caution. *Injury.* 2005;36(1):218-9.
10. Galanopoulos I, Garlapati AK, Ashwood N, Kitsis C. A Wii virtual activity severe thumb metacarpal injury. *BMJ Case Rep.* 2012;10.
11. Cumming D, Mfula N, Jones JWM. Paediatric forearm fractures: The increasing use of elastic stable intramedullary nails. *Int Orthop.* 2008;32(3):421-423.
12. Sproule JA, Roche SJ, Murthy EG. Attritional rupture of extensor pollicislongus: A rare complication following elastic stable intramedullary nailing of a paediatric radial fracture. *Hand Surg.* 2011;16(1):69-72.
13. Stahl S, Calif E, Eidelman M. Delayed rupture of the extensor pollicislongus tendon following intramedullary nailing of a radial fracture in a child. *J Hand Surg Eur Vol.* 2007;32(1):67-8.

© 2015 Alshanawani et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:

<http://www.sciencedomain.org/review-history.php?iid=705&id=38&aid=6585>