

Arthroscopically assisted reduction of type 1A ankle Fractures in Children: Case Report

Zaid Al-Aubaidi¹

What to Learn from this Article?

Insidious presentations of ankle physeal injuries?

Importance of arthroscopic assisted reduction and fixation of ankle physeal injuries?

Abstract

Introduction: The risk of growth arrest following paediatric ankle fractures type 1 A is very high. Therefore all attempts should be done to anatomically reduce this kind of fracture. The advances in ankle arthroscopy have brought the possibility to reduce these fractures under direct vision, without the need of capsulotomy. The purpose of this paper is to stress the importance of the use of arthroscopically assisted reduction of type 1 A fractures.

Case Report: We describe two cases with SH type IV fractures of the distal medial tibia, one treated with open reduction and percutaneous screw fixation and the other treated with arthroscopically assisted reduction and percutaneous screw fixation. The first case ended with severe growth disturbance, while the second gave a very good result.

Conclusion: The use of arthroscopically assisted reduction of type 1 A fractures should be considered to ensure anatomical reduction.

Keywords: ankle fracture, children, arthroscopic assisted reduction

Introduction

Pediatric ankle fractures with involvement of growth plate is the next most frequent after wrist fractures with an incidence of around 30% and estimated to encompass between 33-38% of all physeal fractures in children [1-3]. The asymmetrical closure of the distal tibial growth plate starts medially and then progresses laterally. This explains the pattern of adolescent ankle fractures as the Tillaux and Triplane [3-9].

The use of the arthroscopically assisted reduction of adolescent fractures is well described [10,11]. Salter-Harris (SH) type III and IV of the medial malleolus differ, as they occur in younger patients and have much higher incidence of growth arrest. Thus great care should be taken, when treating these fractures. Since it can be difficult to

differentiate between the two SH types and the treatment does not differ they were reclassified by Nenopoulos as Type IA[6]. We will describe both fractures together treated with different methods.

Case Report

We describe two cases of Type I A according to Nenopoulos classification [6]. One was treated by traditional open reduction and arthroscope was used to aid reduction in other case. These cases not only demonstrate the advantage of arthroscope but also show the varied prognosis in such cases.

Case One: 11 year old boy presented with right ankle fracture, after fall from a trampoline. X-ray showed SH type III of the medial part of the tibia and SH type I fracture of the distal fibula (Fig 1a). The patient was managed by closed reduction and percutaneous Kirschner wire fixation in the distal tibia and fibula (Fig 1b). As postoperative X-ray showed a possible rotation in the medial tibial fracture, a CT scanning was performed revealing that the fracture was in fact a type IV and that there was a big gap in the joint surface. A second operation was therefore performed after 1 week with open reduction

¹Orthopedic surgical department, Pediatric division, Odense university hospital/ Denmark.

Author's Photo Gallery



Dr. Zaid Al-Aubaidi

Address of Correspondence

Dr Zaid Al-Aubaidi, Associate professor, MD, MB,Ch.B,
Orthopedic surgical department, Pediatric division, Odense university hospital/ Denmark.
Telephone 004522543690,
E mail: zaubaidi@hotmail.com

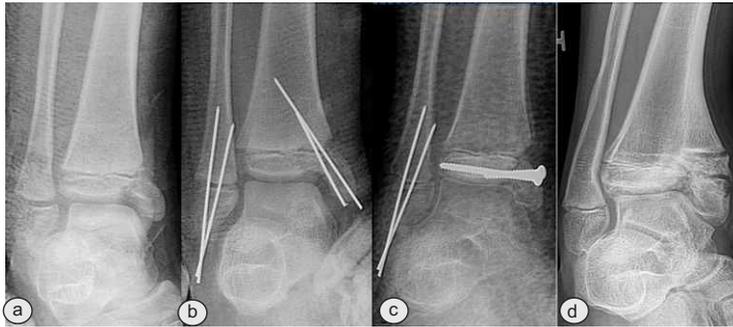


Figure 1: Case1: a- Ankle radiograph showing Salter Harris Type III fracture of medial part of tibia and SH Type I fracture of distal fibula. b- Closed reduction and K wire fixation done. The medial malleolus appeared to be rotated and displaced. c- Opening of medial malleolus demonstrated that it was a type IV SH fracture. Reseat surgical fixation was done using cancellous screws. d- One year post surgery radiograph showing varus deformity and bony bar formation..



Figure 2: Case 2: a-Ankle x ray showing SH type III fracture of medial distal tibial epiphyseal plate. Closed reduction and screw fixation was done. b- post operative CT scan showed joint penetration. c-patient was reoperated with screw removal and arthroscopy assisted percutaneous screw fixation

and internal fixation, using 2 lag screws and a full leg cast was applied for 6 weeks (Fig 1b). Postoperative X-ray showed the fracture reduced to a good position (Fig 1c). The postoperative regime was 4 weeks non-weight bearing, then gradual weight bearing. The screws were removed after 4 months. At one year postoperative control, the patient had normal range of motion of the ankle joint, but X ray showed beginning varus deformity in the ankle (Fig 1d). CT scanning confirmed bar formation and tethering in the medial part of the distal tibial epiphyseal plate. The patient is planned to bar resection and deformity correction

Case two:

11 year old boy presented with right ankle fracture after fall from a height. X-ray showed a SH type III fracture of the distal medial tibial epiphyseal plate (Fig 2a). This was managed with closed reduction and percutaneous screw fixation. Post operative X-ray showed incongruity of the joint surface. CT scanning illustrated a big impression in the joint surface, through where the screw penetrated and a thin metaphyseal flake on the medial side, confirming

that it was a SH type III fracture (Fig 2b). The patient was re-operated after 4 days with removal of the first screw and arthroscopically assisted anatomical reduction of the fracture. The arthroscope was introduced from the anterolateral side and the fracture was reduced using a K-wire as a lever arm. Then a percutaneous screw fixation was performed and arthroscopic pictures were taken peroperatively (Fig 3 a&b). Postoperative X-ray confirmed a good reduction of the fracture and reestablishment of the joint congruity. Postoperatively, the patient was managed with a prefabricated bandage and non weight bearing for 6 weeks. The fracture healed uneventfully, the patient had normal range of motion of the ankle already after 2 months, and the screw was removed after 10 months (Fig 2c). The patient was followed for 16 months, where no complains nor growth disturbance found

Discussion

The last years have brought a growing interest in the arthroscopically assisted reduction of intraarticular adolescent ankle fractures, the so called Tillaux and Triplane fractures [8,10,11]. These fractures, also known as transitioning fractures as they occur at the time of transitioning to skeletal maturity [6-9]. Knowing that, the incidence of developing growth arrest is minimalistic and they rarely give any growth disturbance when they take place beyond the age of 13 [2,4-7,12,13].

SH type III and IV of the medial malleolus is another category of epiphyseal ankle fractures [2]. First recognized by McFarland in 1931 as an adduction fractures, it can occur at a younger age and have much higher incidence of developing a growth arrest [2,6,13]. As it can be difficult by only X-ray to differentiate between these two types and the treatment does not differ, they can be described together. This is also according to the



Figure 3: Intraoperative Arthroscopic pictures confirming no joint penetration by the screw.

classification suggested by Nenopoulos, as he classified both fractures as type 1A [6]. Since they occur primarily in children below 10 years of age, a much higher risk of growth disturbance is expected and special attention should be paid to avoid complications as angular deformity and leg length discrepancy [2,6,12-14]. Besides joint incongruity can take place leading to the development of early osteoarthritis even in children [3,5,6,8,12,14]. In the literature one can find articles warn against the great risk of developing growth arrest with this kind of fracture, but there is no consensus regarding the treatment [13]. Some authors advise to anatomically reduce these fractures, while others believe that fractures with a 2 mm gap can be safely treated in a non-operative manner [2,6,7,12-14]. Generally displaced fractures should be managed with open reduction and internal fixation as to ensure anatomical restoration of the joint surface and reduce the risk of developing a binding bridge [4,5,8,9,15]. We believe that this is difficult to perform by just simple open reduction or some kind of miniarthrotomy. Wide capsulotomy to reduce the intraarticular fracture site may result in extensive scarring and thus limitation of the ankle's range of motion [10]. Furthermore some authors have stressed that open surgical reduction can increase the risk of growth arrest resulting in the development of angular deformity and/or leg-length discrepancies [5]. We agree with Nenopoulos [8] that the impacted fracture fragments can give higher risk of growth plate injury. Arthroscopically assisted reduction gives the opportunity to disimpact and reduce the fracture under direct vision. The use of arthroscopy in this treatment does not need a big routine since it is primarily used as a "Dentist mirror" to visualize the fracture reduction.

To the best of our knowledge, this is the first paper describes the arthroscopically assisted reduction of type 1A fractures. Weakness of this paper is the fact that it is base on only two cases. However the objective is to draw the attention to the importance of treating type 1A paediatric ankle fractures with great caution, since it can give severe deformity and multiple complicated surgeries would be needed to treat growth disturbance. Besides, this paper would hopefully provoke more trials regarding the treatment of type 1A pediatric ankle fractures.

Conclusion

Ankle physeal fractures in children are common but elusive injuries and should be diagnosed with care. Closed reduction and fixation might lead to inferior stability or

intraarticular penetration of the screw. Arthroscopic joint visualisation will prevent this potential complication in such cases

Clinical Message

Arthroscopic visualization of closed reduction in cases of ankle physeal injuries will help in avoiding intraarticular penetration of screws and also aid in assessing good reduction

References

1. Rogers LF. *The radiography of epiphyseal injuries. Radiology* 1970;96:289-299.
2. Cass JR, HA Peterson. *Salter-Harris Type-IV injuries of the distal tibial epiphyseal growth plate, with emphasis on those involving the medial malleolus. J Bone Joint Surg Am.* 1983;65:1059-1070.
3. Jennings MM, Lagaay P, Schuberth JM. *Arthroscopic assisted fixation of juvenile intra-articular epiphyseal ankle fractures. J Foot Ankle Surg.* 2007;46:376-386.
4. LS Dias LS, Giegerich CR. *Fractures of the distal tibial epiphysis in adolescence. J Bone Joint Surg Am.* 1983;65:438-444.
5. Cooperman DR, Spiegel PG, Laros GS. *Tibial fractures involving the ankle in children. The so-called triplane epiphyseal fracture. J Bone Joint Surg Am.* 1978;60:1040-1046.
6. Nenopoulos SP, Papavasiliou VA, Papavasiliou AV. *Outcome of Physeal and Epiphyseal Injuries of the Distal Tibia With Intra-Articular Involvement. J Pediatr Orthop.* 2005;25:518-522.
7. Schnetzler KA, Hoernschemeyer D. *The Pediatric Triplane Ankle Fracture. J Am Acad Orthop Surg* 2007;15:738-747.
8. Panagopoulos A, van Niekerk L. *Arthroscopic assisted reduction and fixation of a juvenile Tillaux fracture. Knee Surg Sports Traumatol Arthrosc.* 2007;15:415-57.
9. Brown SD, Kasser JR, Zurakowski D, Jaramillo D. *Analysis of 51 tibial triplane fractures using CT with multiplanar reconstruction. AJR Am J Roentgenol.* 2004;183:1489-1495.
10. Imade S, Takao M, Nishi H, Uchio Y. *Arthroscopy-Assisted Reduction and Percutaneous Fixation for Triplane Fracture of the Distal Tibia. Arthroscopy.* 2004;20:123-128.

11. Leetun DT, Ireland ML. Arthroscopically assisted reduction and fixation of a juvenile Tillaux fracture. *Arthroscopy*. 2002;18:427-429.
12. Spiegel PG, Cooperman DR, Laros GS. Epiphyseal fractures of the distal ends of the tibia and fibula. Aretrospective study of two hundred and thirty-seven cases in children. *J Bone Joint Surg Am*. 1978;60:1046-1050.
13. Von Laer L. *Pediatric Fractures and Dislocations*. Gerog Thieme Verlag. 2004:389-405.
14. Beaty JH, Linton RC. Medial malleolar fracture in a child. A case report. *J Bone Joint Surg Am*. 1988;70:1254-1255.

Conflict of Interest: Nil
Source of Support: None

How to Cite this Article:

Al-Aubaidi Z. Arthroscopically assisted reduction of type 1A ankle fractures in children: Case Report. *Journal of Orthopaedic Case Reports* 2013 April-June;3(2):12-15



Journal of Medical Thesis is New online Journal form Organization of Research Groups. has been a demand generated Journal. Every year more than six to seven thousand medical thesis are been written , however very few (less than 10%) see the light of publication.

The Journal of Medical Thesis aims to provide a platform for the students and the teachers who have invested both time and effort into the thesis. JMT will be an online, peer reviewed, quarterly Journal which will publish thesis in a format of scientific paper and also make the thesis online for easy Citation.

The Editorial Board of JMT includes many top researcher and head of many department across the country. It includes both national and International Faculties making JMT a truely Global Journal. More than thirty seven Research groups including Indian Orthopaedic Research Group, International Paediatric Research Group, International Radiology Research Group, International Gastroenterology Research group, International Physiotherapy Research Group are part of JMT. This is the Biggest project under the Umbrella of International Organization of Research Group where for the first time all the research groups have come together for making JMT a grand success.

In addition to being a Journal, JMT is also envisioned to be a platform where thesis can be discussed and help regarding Thesis can be provided. Through JMT we will be trying to improve the standard of thesis and research and will be organizing courses on thesis writing and research methodology for postgraduates. JMT is envisioned not only as a Journal but as a complete portal for Medical Thesis and active participation form all Editorial board members will help us achieve this goal.

In due course we wish JMT to be a complete source of information, guidance and publishing platform for all students who wish to conduct a good thesis work.

We take this oppurtunity to invite articles for JMT. For more details please visit www.journalmedicalthesis.com or write to us at journalmedicalthesis@gmail.com