Rare disease

Simultaneous bilateral elbow dislocation with bilateral medial epicondyle fractures in a 13-year-old female gymnast with hyperlaxity

Stefan Bauer,¹ Ben Dunne,² Colin Whitewood¹

¹Department of Orthopaedics, Princess Margaret Hospital for Children, Perth, Western Australia, Australia

²Department of Surgery, Princess Margaret Hospital of Children, Perth, Western Australia, Australia

Correspondence to Dr Stefan Bauer, stef11bau@yahoo.co.uk

Summary

Bilateral simultaneous elbow dislocations are extremely rare and have only been described in 12 cases. In the paediatric population unilateral elbow dislocations are rare with 3–6% of all elbow injuries and there are only few studies describing this injury exclusively in children. There is only one case report of a paediatric patient who sustained a simultaneous bilateral elbow dislocation with medial epicondyle fractures. We present a second paediatric case of simultaneous bilateral elbow dislocation with associated displaced bilateral medial epicondyle fractures in a gymnast with joint hyperlaxity (3 of 5 Wynne-Davies criteria) treated with closed reduction and short-term immobilisation (3 weeks). The patient returned to full trampoline gymnastics between 4 and 5 months postinjury and made an uneventful recovery.

BACKGROUND

Simultaneous elbow dislocation is extremely rare in the paediatric population and seems to have a higher incidence in female gymnasts with hyperlaxity. This association has not been pointed out in the literature as yet.^{1–14}

CASE PRESENTATION

A 13-year-old trampoline gymnast was brought to the emergency department by ambulance with simultaneous bilateral elbow dislocations after landing on both hands with extended elbows. The parents reported a history consistent with joint hyperlaxity of the patient, including the ability to hyperextend the elbows. There was also a positive family history for joint hyperlaxity on the mother's side. The mother reported that her daughter had not had any menstrual bleeding around the time of the injury.

Clinical examination showed deformity of both elbows with loss of posterior triangular relationships of the olecranon and epicondyles suggesting bilateral posterolateral elbow dislocation associated with swelling and haematoma formation. The neurovascular status of either upper limb was unremarkable.

Features of hyperlaxity¹⁴ such as 'thumb touching forearm', and 'fingers parallel to forearm on dorsiflexion' were present on examination.

INVESTIGATIONS

Initial x-rays confirmed bilateral posterolateral elbow dislocations with associated displaced medial epicondyle fractures (figure 1A–D).

TREATMENT

The dislocations were reduced in the emergency department under deep sedation by the orthopaedic registrar. Non-circumferential above elbow plaster slabs were

applied with inclusion and immobilisation of the wrists. Radiographs showed reduction of the elbows and epicondyles (figure 1E–H).

OUTCOME AND FOLLOW-UP

The patient was followed up at 1 and 3 weeks with x-rays and allowed to mobilise both elbows after week 3. At follow-up 2, 3 and 5 months after the injury the patient reported good range of movement and no problems with instability. The range of motion (ROM) on examination at 3 months was 20°/0°/140° on the left (20° hyperextension) and 0°/0°/140° on the right with no restriction of pronation and supination. Menarche occurred 3 months after the injury as reported by the mother. The peak growth spurt was estimated to lie within 6–12 months after the injury.

Examination for joint hyperlaxity showed 3 of 5 positive criteria:¹⁴ 'thumb touching forearm', 'fingers parallel to forearm on dorsiflexion' and hyperextension of the left elbow to 20° (figure 2).

Gradual return to trampoline gymnastics from the third month postinjury was uneventful and the patient reported full return to gymnastics after 4 and 5 months.

DISCUSSION

Simultaneous bilateral elbow dislocations have previously been reported in six female and six male patients and occurred in all but one case after a fall on outstretched hands with extended elbows.

All reported bilateral dislocations occurred in posterior direction apart from one case of bilateral anterior dislocation caused by a fall from a height on both olecrani with flexed elbows.⁴ Of the 12 bilateral dislocations, associated fractures were seen in seven elbow joints (four radial head fractures and three medial epicondyle fractures). There is

Figure 1 Radiographs of bilateral elbow dislocations (A–D) with associated medial epicondyle fractures (arrows in B and D). Antero-posterior and lateral radiographs of both elbows showing concentric reduction of the ulnohumeral joints (E–H) and fracture reduction of medial epicondyles (arrows in E and G).

only one report of a paediatric patient (gymnast <16 years of age) who sustained a bilateral posterior elbow dislocation with bilateral medial epicondyle fractures requiring open reduction and bilateral K-wire fixation.⁶ One further female gymnast of the age of 16

sustained bilateral dislocations with unilateral medial epicondyle fracture which required fixation with K-wires.⁷

Our case of a 13-year-old female gymnast is the second reported paediatric case with bilateral simultaneous elbow dislocations with associated bilateral displaced medial

Figure 2 Demonstration of Wynne-Davies criteria for joint hyperlaxity (A–E) with positive criteria in A, B and C.

Table 1 Literature review of simultaneous bilateral elbow dislocations

Author	Year	Age, Sex	Mechanism	Direction	Fracture	Treatment	Outcome	Hyperlaxity
Schonbauer ¹	57	43, F	Fall onto hands with extended elbows	Posterior	Nil	Not reported	Not reported	Not reported
Klever ²	61	19, M	Fall off bike onto hands with extended elbows	Posterior	Nil	Reduction, nil else reported	Not reported	Not reported
Kovrizhnyi et al ³	69	16, F	Gymnast, fall onto hands with extended elbows	Posterior	Nil	Reduction	From, return to gymnastics at 4 months	Not reported
Oury et al ⁴	72	20, M	Marine, fall onto elbows	Anterior	Nil	5/7 immobilisation	From, stable	Not reported
Maitra ⁵	79	21, F	Gymnast, fall onto hands with extended elbows	Posterior	Nil	3/52 Immobilisation in collar and cuff	50°–140° 40°–150°	Not reported
Tayob et al ⁶	80	13, F	Gymnast, fall onto hands with extended elbows	Posterior	Bilateral medial EC	K-wires after open reduction	Not reported	Not reported
Jensen et al ⁷	83	16, F	Gymnast, fall onto hands with extended elbows	Posterior	Unilateral Medial EC	K-wires and 6/52 immobilisation 3/52 immobilisation	Good, return to sport	Not reported
Wilson ⁸	90	47, M	Hang-gliding into cliff, impact on hands with extended elbows	Posterior	Nil	1/52 immobilisation	From, stable	Not reported
Syed et al ⁹	99	20, F	Gymnast, fall onto hands with extended elbows	Posterior	Unilateral radial head fracture	1/7 immobilisation	From, stable	Present
Raman et al ¹⁰	05	34, M	Police officer, fall onto hands with extended elbows	Posterior	Bilateral radial heads	ORIF with T-plates	10°–135° 15°–130°, stable	Not reported
Koslowsky et al ¹¹	06	55, M	Worker, fall off ladder onto hands with extended elbows	(1) Posterior	nil	External fixation with motion since unstable	0°/10°/140° 0°–130°	Not reported
		24, M	Fall off mountain bike onto hands with extended elbows	(2) Posterior	Unilateral radial head	Threaded pins for radial head	0°–125° 0°/10°/130°	Not reported

epicondyle avulsion fractures and the only reported case that was treated with bilateral closed reduction and short-term immobilisation.

Gymnastics is the most frequently associated sport for bilateral dislocations^{3–7,9} and all reported cases in gymnasts occurred in females. Up to 25 h training per week with an incidence of 4.8% of elbow injuries¹⁵ seems to increase the incidence of bilateral injury in this sport. General joint laxity is prevalent in female gymnasts¹⁶ including hyperextension of the elbow. The association between joint hyperlaxity and simultaneous bilateral elbow dislocation has previously been found and suggested⁹ but has not been reported in other case reports. Assessment of Wynne-Davies criteria demonstrated joint and elbow hyperlaxity in our case.

A higher association of female gender with joint laxity in the sports population as well as in general has well been documented in the literature with a joint laxity incidence of 22–33% in women compared with 6–14% in men.^{17–19} A gender ratio of 3.7:1 has been reported in one large study.¹⁹ Joint laxity was found to be highest in girls at 15 years of age. This peak lies close to the median age of female gymnasts with reported bilateral elbow dislocations (median age 16 years; table 1). This age peak is likely to be associated with hormonal changes prior to full osteoarticular maturity. Our patient sustained the injuries 3 months prior to her menarche and within 6–12 months of her growth spurt. Despite absence of menstrual cycles at the time of injury, hormonal changes may already have contributed to the injuries. In the literature hormonal influences on elbow injuries and laxity have not been reported. However the influence of the menstrual cycle on knee laxity as a possible cause for the higher incidence of cruciate ligament injuries in female athletes has been documented and investigated.^{20,21}

Treatment of elbow dislocations in paediatric patients with associated displaced epicondylar fractures has been controversial. Some authors have recommended open reduction and internal fixation in all cases to prevent non-union and instability.²² Others have considered surgery for the entrapped or displaced epicondyle to restore congruency and stability of the elbow.^{12,23,24} Immobilisation for 3 weeks in case of closed reduction without fixation and 4 weeks for open reduction and fixation have been recommended with better results and full recovery in all non-operative cases.¹³

Learning points

- ▶ Bilateral elbow fracture dislocations are extremely rare in the paediatric population.
- ▶ They are associated with female gender, joint hyperlaxity and gymnastics.
- ▶ Hormonal influences seem to increase injury vulnerability in teenage years.
- ▶ Successful reduction should be followed by short-term immobilisation.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. Schonbauer HR. Simultaneous, bilateral dislocation of the elbow. *Monatsschr Unfallheilkd Versicherungsmed* 1957;**60**:119–21.
2. Klever H. Congruent simultaneous dislocations of the elbow. *Monatsschr Unfallheilkd Versicherungsmed* 1961;**64**:190–2.
3. Kovrizhnyi VG, Savin EM. A case of simultaneous bilateral luxation in the elbow joint. *Klin Khir* 1969;**5**:65.

4. **Oury JH**, Roe RD, Lanning RC. A case of bilateral anterior dislocations of the elbow. *J Trauma* 1972;**12**:170–3.
5. **Maitra AK**. A rare case of bilateral simultaneous posterior dislocation of the elbow. *Br J Clin Pract* 1979;**33**:233–5.
6. **Tayob AA**, Shively RA. Bilateral elbow dislocations with intra-articular displacement of the medial epicondyles. *J Trauma* 1980;**20**:332–5.
7. **Jensen UH**, Rud B. Bilateral dislocation of the elbows. *Ugeskr Laeg* 1983;**145**:1784.
8. **Wilson A**. Bilateral elbow dislocation. *Aust N Z J Surg* 1990;**60**:553–4.
9. **Syed AA**, O'Flanagan J. Simultaneous bilateral elbow dislocation in an international gymnast. *Br J Sports Med* 1999;**33**:132–3.
10. **Raman R**, Srinivasan K, Matthews SJE, *et al*. Bilateral radial head fractures with elbow dislocation. *Orthopedics* 2005;**28**:503–5.
11. **Koslowsky TC**, Mader K, Siedek M, *et al*. Treatment of bilateral elbow dislocation using external fixation with motion capacity: a report of 2 cases. *J Orthop Trauma* 2006;**20**:499–502.
12. **Carlroz H**, Abols Y. Posterior dislocation of the elbow in children. *J Pediatr Orthop* 1984;**4**:8–12.
13. **Rasool MN**. Dislocations of the elbow in children. *J Bone Joint Surg Br* 2004;**86**:1050–8.
14. **Wynne-Davies R**. Acetabular dysplasia and familial joint laxity: two etiological factors in congenital dislocation of the hip. A review of 589 patients and their families. *J Bone Joint Surg Br* 1970;**52**:704–16.
15. **Caine D**, Cochrane B, Caine C, *et al*. An epidemiologic investigation of injuries affecting young competitive female gymnasts. *Am J Sports Med* 1989;**17**:811–20.
16. **Gannon LM**, Bird HA. The quantification of joint laxity in dancers and gymnasts. *J Sports Sci* 1999;**17**:743–50.
17. **Brannan TL**, Schulthies SS, Myrer JW, *et al*. A comparison of anterior knee laxity in female intercollegiate gymnasts to a normal population. *J Athl Train* 1995;**30**:298–301.
18. **Decoster LC**, Vailas JC, Lindsay RH, *et al*. Prevalence and features of joint hypermobility among adolescent athletes. *Arch Pediatr Adolesc Med* 1997;**151**:989–92.
19. **Jansson A**, Saartok T, Werner S, *et al*. General joint laxity in 1845 Swedish school children of different ages: age- and gender-specific distributions. *Acta Paediatr* 2004;**93**:1202–6.
20. **Park S-K**, Stefanyshyn DJ, Ramage B, *et al*. Alterations in knee joint laxity during the menstrual cycle in healthy women leads to increases in joint loads during selected athletic movements. *Am J Sports Med* 2009;**37**:1169–77.
21. **Zazulak BT**, Paterno M, Myer GD, *et al*. The effects of the menstrual cycle on anterior knee laxity: a systematic review. *Sports Med* 2006;**36**:847–62.
22. **Schwab GH**, Bennett JB, Woods GW, *et al*. Biomechanics of elbow instability: the role of the medial collateral ligament. *Clin Orthop Relat Res* 1980;**146**:42–52.
23. **Roberts PH**. Dislocation of the elbow. *Br J Surg* 1969;**56**:806–15.
24. **Fowles JV**, Slimane N, Kassab MT. Elbow dislocation with avulsion of the medial humeral epicondyle. *J Bone Joint Surg Br* 1990;**72**:102–4.

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