Diagnosis and treatment of children with a radiological Fat Pad Sign without visible elbow fracture: an international survey

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Background

Children often present at the emergency department with a suspected elbow fracture.
Sometimes the only radiological finding is a 'fat pad sign' (FPS) as a result of hydrops or haemarthros.
This could either be the result of a fracture, or of an isolated intra-articular haematoma.[1,2]

AIM:
1) to obtain insight in FPS definition, diagnosis and treatment amongst international colleagues
2) to identify a uniform definition based on radiographic measurements with optimal cut-off points via ROC-curve.

Methods

An online international survey was set up to
- assess the general treatment strategy
- criteria and definition of the FPS
- the probability for occult fracture and
- presence of the anterior and/or posterior FPS on 20 radiographs.

Additionally, radiographic measurements were performed by the research team to identify cut-off values for a positive FPS, as well as test-retest reliability and interrater reliability via intraclass correlation coefficient (ICC). Retrospective analysis of patients was carried out to determine the sensitivity and specificity via the ROC-curve.

Respondent Diagnosis and Treatment

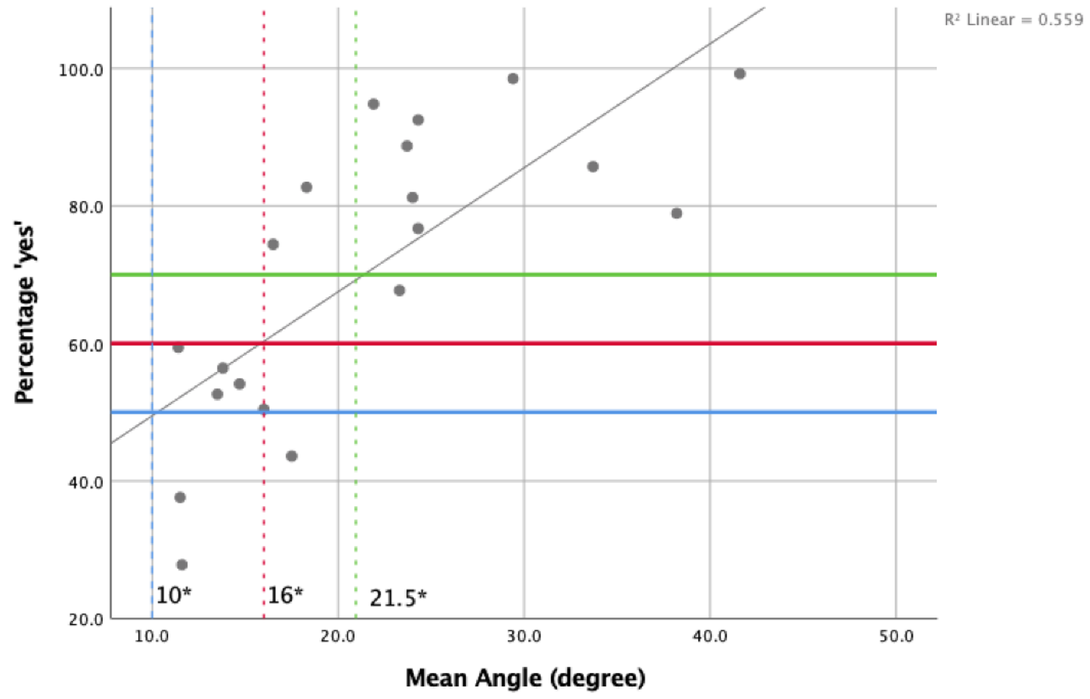
Survey Questions	
What is the most probable fracture?	**Responses, n(%)**
Supracondylar	87 (65.4)
Radial head	18 (13.5)
Radial neck	11 (8.3)
Lateral condyle fracture	6 (4.5)
Medial epicondyle	5 (3.8)
Olecranon	2 (1.5)
Other	4 (3.0)
What is your usual further diagnostic work-up in case of a positive fat pad sign without visible fracture?	
Repeat X-rays after 1 week	42 (31.6)
No further imaging	35 (26.3)
Repeat X-rays on indication	30 (22.6)
Other	15 (11.3)
CT	7 (5.3)
MRI	4 (3.0)
What is your standard treatment in case of a positive fat pad sign without visible fracture?	
Plaster/casting	70 (52.6)
Other	25 (18.8)
No standard treatment	11 (8.3)
Pressure bandage	11 (8.3)
Functional treatment (i.e. no immobilization)	8 (6.0)
Sling	8 (6.0)

Reference:

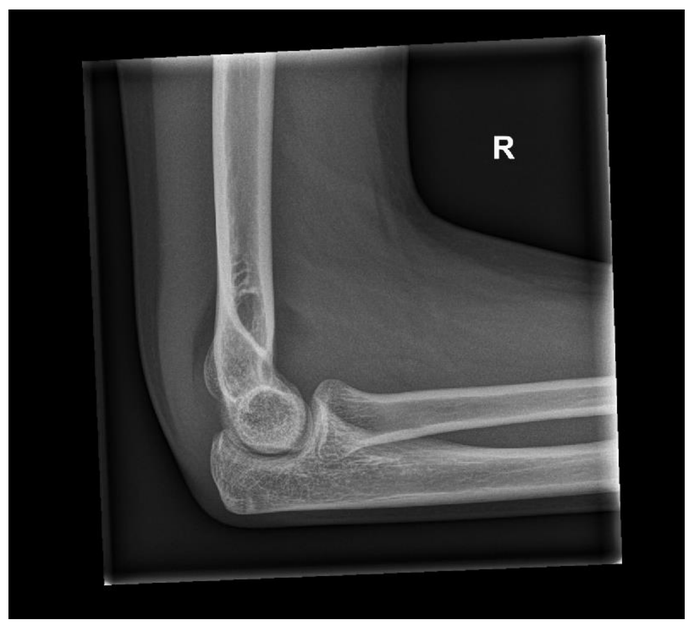
1. Skaggs, D. L., & Mirzayan, R. (1999). The Posterior Fat Pad Sign in Association with Occult Fracture of the Elbow in Children*†. *The Journal of Bone & Joint Surgery*, *81*(10), 1429–1433.
2. Al-Aubaidi, Z., & Torfing, T. (2012). The role of fat pad sign in diagnosing occult elbow fractures in the pediatric patient. *Journal of Pediatric Orthopaedics B*, *21*(6), 514–519.

Results

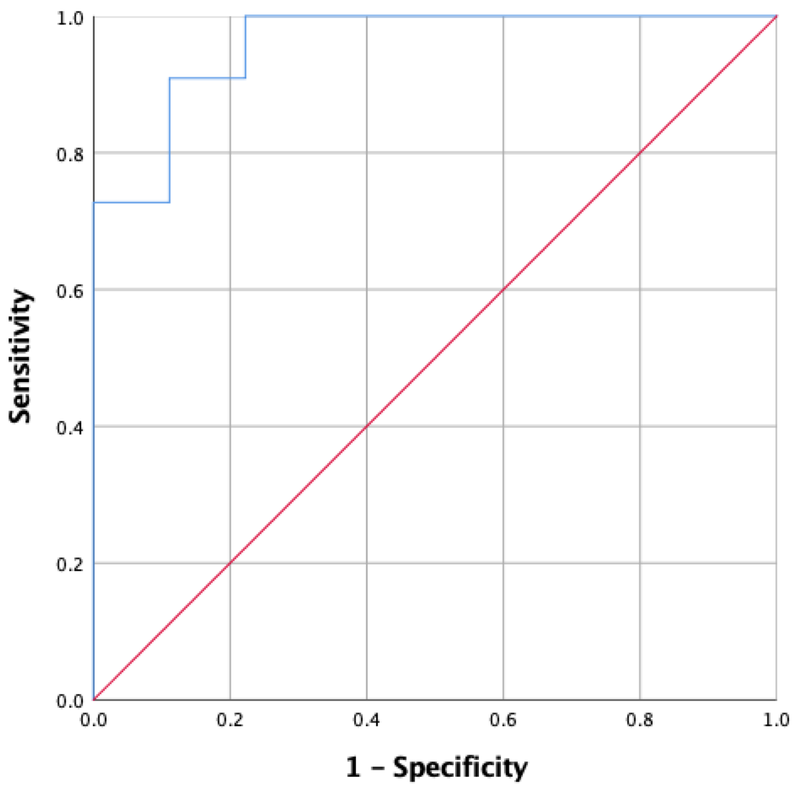
Percentage 'yes' for presence anterior FPS assessed for the 20 X-rays plotted against angle constructed via ICC



Anterior and posterior FPS



ROC



The ROC has an area under the curve (AUC) of 0.96 (95% CI 0.88-1.00) with p-value of 0.06. The optimal cut-off point is at 14 degrees with a sensitivity of 1.00 and a specificity of 0.56.

Conclusions

Definitions, Diagnosis and treatment of patients with the FPS varies among international colleagues. This study has identified a clear definition of a positive FPS, And is the first step towards improving diagnosis and treatment of these patients