

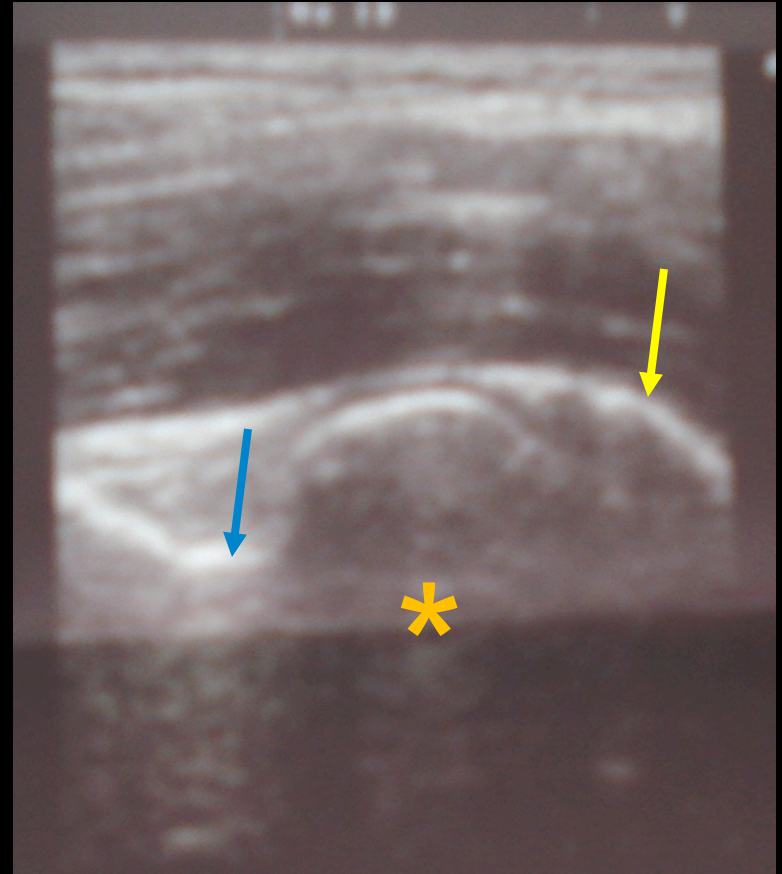
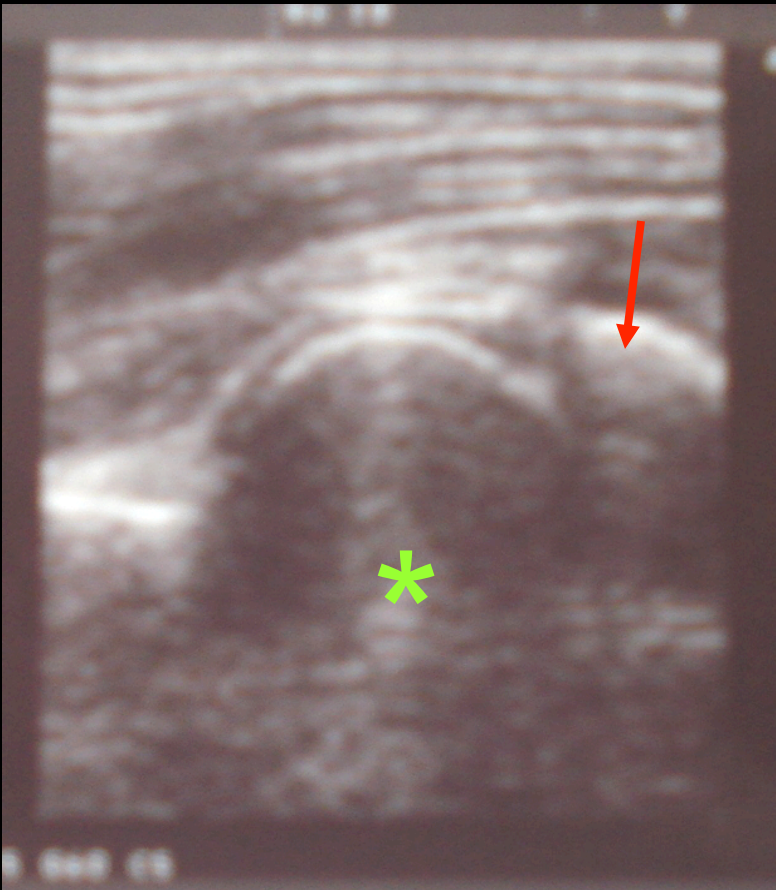


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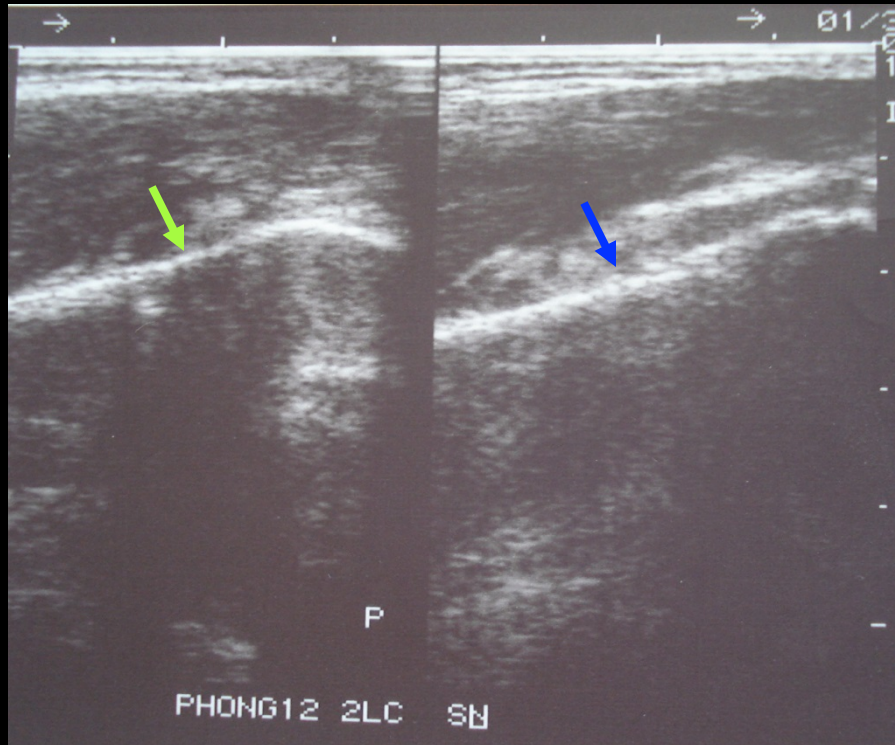
The treatment of displaced supracondylar fractures of the humerus in children by closed reduction under ultrasound guidance and percutaneous pinning

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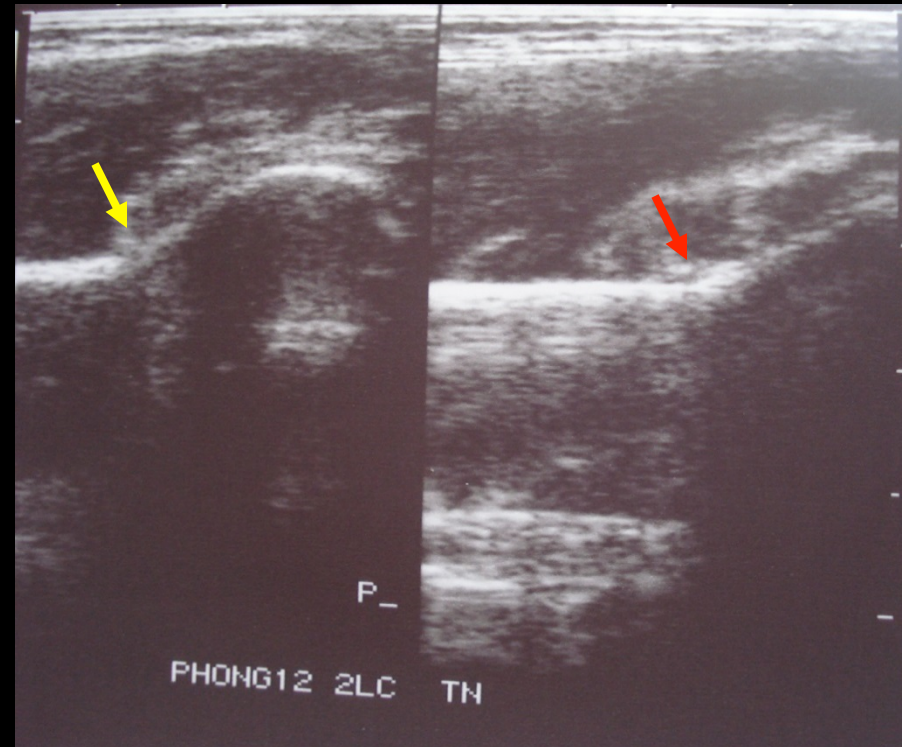
Ultrasound images of supracondylar fractures of the humerus, showing the anterior aspect of the distal humerus. The left image shows the lateral condyle (green asterisk) and the radial head (red arrow). The right image shows the coronoid fossa (blue arrow), the trochlea (orange asterisk) and the coronoid process (yellow arrow).



Ultrasound image of the posterior aspect of the distal humerus



Undisplaced medial and lateral borders (blue arrows)

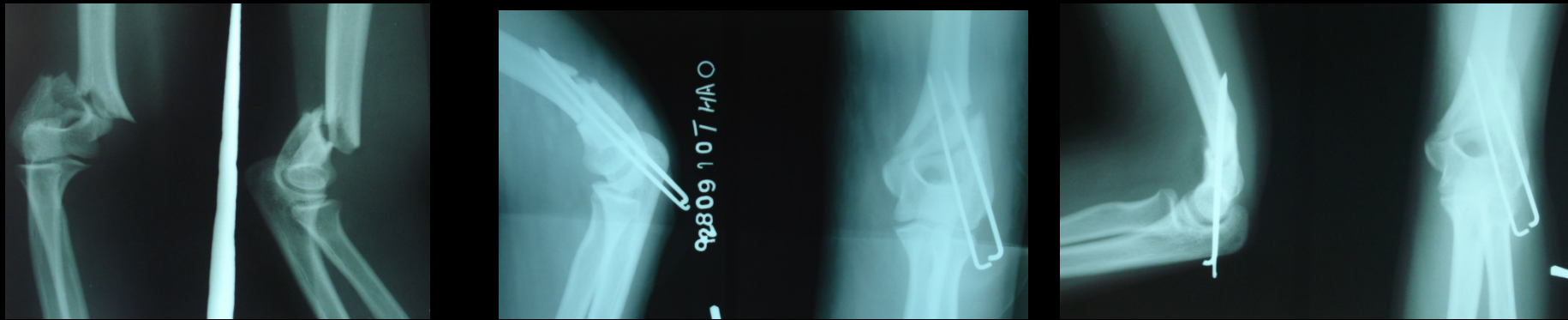


Posterior angulation of medial border (yellow arrow) and lateral border (red arrow)



Results and Discussions

- From November 2009 to September 2011, we treated 61 patients with closed reduction under ultrasound guidance and percutaneous pinning.
- Three cases was converted to open reduction: one case at the first part of our learning curve when we had limited experience to detect displacement, one case with irreducible interposed soft tissue, one case with unstable fracture.
- Our average follow-up duration is 10.8 months (6-18 months)



Preoperative, early postoperative and before pin removal X-rays



This patient has brought pins for 8 weeks, without pin tract infection

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Advantages of our method:

- Short hospitalization: 3.4 days
- Average operative time: 55.2 minutes (20-110 minutes)
- Average use of antibiotics: 3.5 days
- Limited surgical disposables and equipment resources
- Limited investment: our method does not require imaging intensifier; lead apron; lead X-ray glass; lead shielding for walls, ceilings and floors.



Ultrasound does not expose radiation to staff, patient and environment.

“All radiologic imaging procedures have been reported to be potential sources of malignant disease, irrespective of the dose used. Previous studies reported a death rate of 0.3% due to diagnostic radiation exposure. At the second International Congress of Radiation Exposure in Berlin in April 1995, new studies were presented that reported an estimated death rate of above 10%. Even more disconcerting is the fact that the damage caused by X-rays in children is much higher than that in adults” [4].

Ultrasound machines are affordable in many hospitals. Five cases in our study were failed to reduce blindly, became successfully treated with reduction under ultrasound guidance. Therefore, ultrasound machines help to check the treatment quality in real-time manner without radiation exposure.

We also find that it is easier to move the ultrasound probe and ultrasound machine than to move the C-arm and imaging intensifier machine.



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- We had patient and family satisfaction at the rate of 98.3%, only 1 case (1.7%) worried about the abundant callus at the early healing stage.
- Pins were removed at 4.1 weeks, averagely.
- Rehabilitation program: finger and wrist exercise from day 2, gentle elbow exercise from day 7



CONCLUSIONS

- Closed reduction under ultrasound guidance is a safe option in the treatment of supracondylar fractures of the humerus in children. This method of treatment has no side effects, few complications and no radiation exposure.
- This method may be indicated for all patients with displaced supracondylar fractures of the humerus who have no preoperative neurovascular complications and third osseous fragment.
- This method has many advantages: no open reduction, no blood loss with anatomic reduction.



- Cosmesis and function results are rated excellent and good in 94.8% cases, two cosmetic 1-mm surgical scars, less postoperative pain.
- No septic arthritis and osteomyelitis, no malunion, early mobilization, no elbow stiffness, short hospitalization of 3-4 days.
- High patient satisfaction (98.3%).
- An economic method: low treatment cost, short hospital stay, low investment.

