Ultrasound and radiological features of supracondylar humerus fractures in children

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Disclosures
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INTRODUCTION: It has been reported that brachial artery injuries occur in 12-15% of supracondylar fractures of the humerus in children. However, the presence of collateral circulation, and few cases require deployment during emergency surgery. The management and evaluation of such a Pink Pulseless Hand (PPH) is still a matter of debate. Preoperative ultrasound (US) evaluation of the vessels and nerves in pediatric supracondylar humerus fractures may be useful in assessing the need for treatment of the vessels. In this study, we report on the X-ray and US features of supracondylar humerus fractures in children.

METHODS:
The subjects were 40 children diagnosed and treated for supracondylar fractures of the humerus at our hospital. The patients were evaluated by X-ray, blood flow, neurological evaluation, and examination for PPH. First, the Wilkins-modified Gartland classification was used in the preoperative X-rays. Next, the preoperative fracture site was evaluated by US. Periosteum, brachialis muscle, blood vessels and blood flow were evaluated. US classification was as follows: US-Type 1: Fracture without rupture of the periosteum. US-Type 2: Partial damage to the periosteum. Type 3a: Partial damage to the brachialis muscle. US-Type 3a-c: Complete injury of the brachialis muscle. US-Type 3b: Humerus displaced laterally and in contact with the radial nerve. US-Type 3c: Humerus displaced laterally and in contact with the radial nerve. US-Type 4: (Kinking), The brachial artery is entrapped at the fracture site. No blood flow despite reduction. The US classification are shown in Figure 1. The Wilkins-modified Gartland classification was compared with the US classification. This study was reviewed and approved by the ethics committee of our institution.

RESULTS SECTION: There were 29 boys and 11 girls. The average age of the patients was 5.4 years (3-11 years). Wilkins-modified Gartland classification by X-ray was Type 1 in 3 cases, 10 cases with Type 2A, 4 cases with Type 2B, and 22 cases with Type 3. PPH was present in 6 cases. US classification was as follows: US-Type 1 in 3 cases, US-Type 2 was 9 cases, US-Type 3a was 15 cases, US-Type 3a-c was 6 cases, US-Type 3b was 1 case, US-Type 3c was 2 cases, and US-Type 4 was 4 cases. All cases of PPH were classified as type 3-c or 4. The Wilkins-modified Gartland classification classification was as shown in Figure 2. DISCUSSION: In pediatric patients with supracondylar fractures of the humerus, two out of six cases of PPH were found to be Kinking on US, and two out of six cases of pulse were improved by reduction. Wilkins-modified Gartland classification Type 3 was observed in 22 cases, which were classified into 5 categories from Type 3a to Type 4 according to the tear of the brachialis muscle, blood vessels and blood flow. Type 3c and Type 4 are indicated for emergency surgery, and Type 3c can be treated by percutaneous insertion of steel wire even in PPH. US-type 4 requires an open exploration. In the Wilkins-modified Gartland classification Type 2A, the anterior periosteum was thought to be damaged. However, the US showed that the periosteum in Type 2A was not completely torn, and most of the periosteum remained intact.

Significance/Clinical Relevance: US evaluation of supracondylar fractures of the humerus in children helps to determine and decide which cases require emergency surgery.