ORIENTATION OF THE SIGMOID NOTCH OF THE DISTAL RADIUS : DETERMINATION OF DIFFERENT TYPES OF THE DISTAL RADIOULNAR JOINT

L. DE SMET, G. FABRY

The orientation of the sigmoid notch of the distal radius is related to the ulnar length. In the ulna plus there is a spherical notch, in the ulna minus it is conical and in neutral it is usually cylindrical, sometimes conical.

Keywords : sigmoid notch ; distal radius ; radioulnar joint.
Mots-clés : radius ; extrémité inférieure ; cubitus.

INTRODUCTION

The sigmoid notch and the ulnar head are the contributing parts of the distal radioulnar joint (DRUJ).

According to Bowers (3), Kapandji (8) Af Ekenstam (1, 2), Linscheid (11), Palmer (16) both are congruent. The inclination of the seat of the ulnar head and sigmoid notch has been described as being 20° with the anatomical axis of the ulna (fig. 1). Observation of different radiographs revealed different angulations, which seemed to correlate with the relative length of the ulna (ulnar variance). Three morphological types have been described by Föstner in 1986 (5, 6).

We were disappointed in joint leveling procedures as well in Kienböck's disease (ulnar lengthening or radial shortening) as in ulnar shortening for the ulnar impaction syndrome (7). The reason could be the different morphology of the DRUJ and the subsequent impingement after those procedures. The purpose of this paper is to verify Föstner's theory and determine "risk-morphotypes".

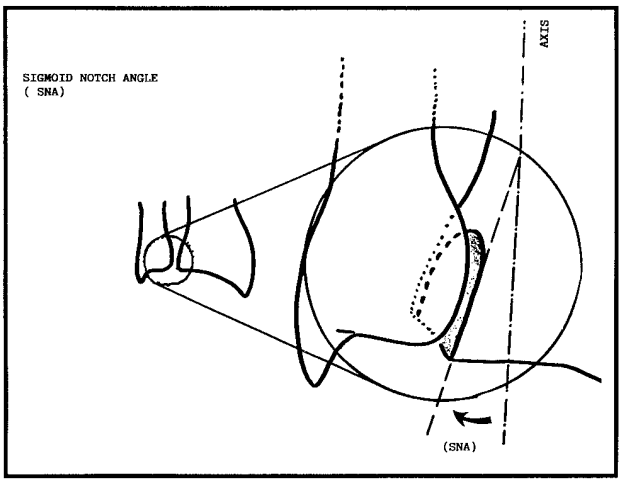

Fig. 1. — "Classical" morphology of the distal radioulnar joint (SNA = sigmoid notch angle).

MATERIAL AND METHODS

For this purpose 100 PA radiographs of the wrist were randomly choosen ; those with obvious pathology of the DRUJ as fractures in or around the ulnar head, inflammatory changes or tumors were excluded, as were all patients with previous trauma and/or operations on the forearmbones. Only adults with closed growthplates were included in the survey. All radiographs were taken in the "zero" position as recommended by Epner (4), Palmer (13), Kristensen (10) and

University Hospital, Department of Orthopedics, Katholieke Universiteit Leuven, B-3212 Pellenberg, Belgium.
Correspondence and reprints : L. De Smet.

Nakamura (11). The ulnar variance was measured according to the technique of Palmer (13). The angulation of the sigmoid notch corresponds with a radiographic condensation line, as seen in figure 2. A metal marker was placed in the notch of a dried radius ; the angle matched the one drawn on the condensation line. By convention an angle directed from proximal radial to distal ulnar was called positive, zero was when the notch was parallel with the anatomic axis and negative when directed distal radial.

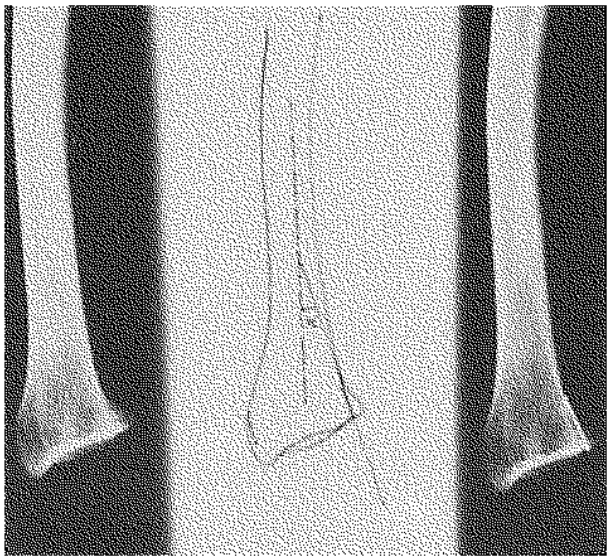

Fig. 2. — Orientation of the sigmoid notch (with metallic marker).

RESULTS

The mean sigmoid notch angle was 9.39°, (SD = 7.6) and 37 wrists had an ulnar minus, 33 an ulnar zero and 30 an ulnar plus. The angle for the ulna minus variants was 15.69° (SD = 6.1) ; for the ulna zero, 3.25° (SD = 8.2) ; and for the ulna plus, - 8.03° (SD = 8.5).

For the variances differing by more than 2 mm the angle was 17° for ulna minus, and - 12.4° for ulna plus. Of all the ulna minus, 36 (97%) had a positive angle, of the ulna plus 220 (67%) had a negative orientation. For the neutral ulnas 10 had a positive, 2 a negative and 21 had a zero angle plus or minus 5°.

Statistical analysis of these data demonstrated that for the mean value as well as for the distribution the differences are highly significant ($p < 0.001$).

DISCUSSION

Although the anatomy has been studied in detail, the morphology-geometry of the sigmoid notch had been neglected. Most authors describe an angle of 20° (1, 2, 9, 11, 14), mostly based on a limited number of anatomical sections. Only Linscheid (11) mentioned the possibility of a reversed angle in ulna plus. The higher prevalence of ulna minus in the normal population (12) can explain the orientation of this angle. Fostner (5) in 1986 demonstrated different morphological types of sigmoid notches. He found a cylindrical shaped notch in ulnae zero, a hemispherical in ulna plus and in ulna minus a cylindrical or conical shaped notch. This was confirmed, without hard data however, by Kauer (9). This survey is an additional confirmation of his observation. The angulation of the sigmoid notch is an easy way to predict the shape of the notch : positive angle equals conical shape (type 1), neutral angle a cylindrical shape (type 2) and negative angle a hemispherical shape (type 3) (fig. 3).

This distribution of different shapes explains dyscongruency after distal radial fractures and makes procedures which changes the length of one of the forearmbones hazardous.

The conical type notch impingement is a possibility after radial shortening or ulnar lengthening, and the spherical notch in ulna plus can cause incongruency of the DRUJ after ulnar shortening (fig. 4).

Table I

U.V.	N	Mean	SD	SNA $> 5°$	SNA $0° \pm 5°$	SNA $< -5°$
U +	30	8.03°	8.5	3	7	20
U (zero)	33	3.25	8.2	10	21	2
U -	37	15.69°	6.1	36	1	0

U.V. : ulnar variance ; SNA : Sigmoid Notch Angle.

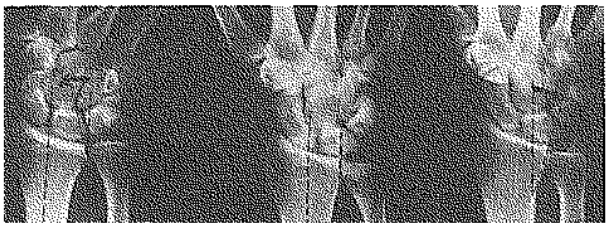

Fig. 3a

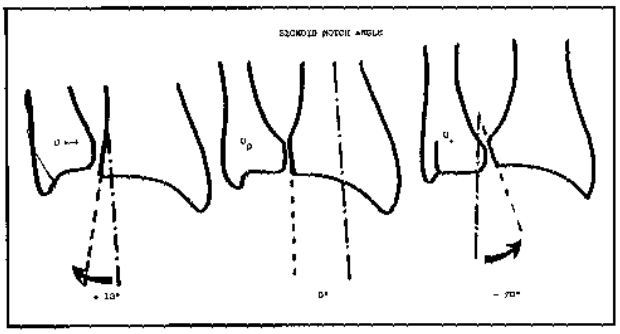

Fig. 3b

Fig. 3. — Different types of DRUJ-morphology.
a) on xray.
b) schematic drawing.

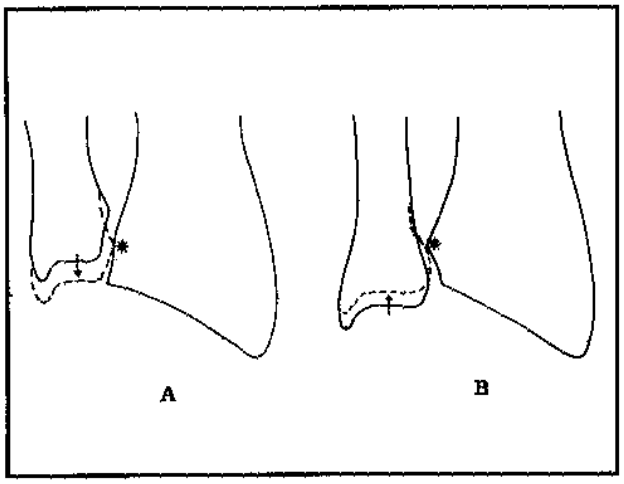

Fig. 4. — Possible iatrogenic impingement.

CONCLUSION

The sigmoid notch has not that similar orientation nor morphology as previously reported.

The morphology and orientation depends on the relative length of the ulna.

Changing the length of one of the forearm bones is hazardous and special attention to these findings concerning the sigmoid notch are recommended.

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SAMENVATTING

L. DE SMET, G. FABRY. Oriëntatie van de sigmoid notch van de distale radius. Beschrijving van verschillende types distaal radio ulnair gewricht.

De helling van de sigmoid notch van de distale radius wisselt nogal en is afhankelijk van de relatieve lengte van de ulna.
Bij de ulna plus is het sfeervormig, bij ulna min conisch en bij neutrale ulna meestal cilindrisch, soms conisch.

RÉSUMÉ

L. DE SMET, G. FABRY. Orientation de la cavité sigmoïde du radius. Variations morphologiques.

L'orientation de la cavité sigmoïde du radius n'est pas constante et dépend de la variance cubitale.
En cas de cubitus court il s'agit d'un cône, en cas de cubitus long le forme est hémisphérique. Le cubitus neutre est associé à une cavité sigmoïde cylindrique ou parfois conique.