

## Short Report

# The glenoid notch and its relation to the shape of the glenoid cavity of the scapula

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### ABSTRACT

The prevalence of a notch in the anterior margin of the glenoid cavity of 236 scapulae (118 female, 118 male) was investigated. The notch was found in 129 scapulae (55%) and gave rise to a pear-shaped cavity. In 107 scapulae (45%) the notch was absent, the shape of the cavity being oval. No sex difference was found in the prevalence of the notch. If a distinct notch exists, the glenoid labrum is not attached to bone at the notch and is therefore liable to be sheared off (Bankart lesion).

*Key words:* Skeletal anatomy; Bankart lesions.

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### INTRODUCTION

Most of the standard anatomical textbooks describe the shape of the glenoid cavity as pear-shaped, round, oval or having an inverted comma-shape. During our examination concerning the sex dimorphism of the glenoid cavity (Prescher & Klümpen, 1994, 1995) we observed that all these descriptions may be accurate, depending on the presence or absence of a distinct glenoid notch. According to Fick (1904) the glenoid notch is located at the anterior margin of the glenoid cavity. The notch is situated somewhat above the middle of the anterior margin of the cavity and can be very prominent (Fig. 1*a*), very shallow (Fig. 1*b*) or absent (Fig. 1*c*). Von Langer (1882) termed the glenoid notch the *incisura acetabuli*. It is only briefly mentioned in the paper by Huber (1991). It is remarkable that the notch is rarely mentioned in the standard anatomical textbooks although it is noted, for example, by Rouvière (1967), Gardner et al. (1969), Woodburne & Burkel (1988) and Grant (1989). In the French literature (Rouvière, 1967) it is designated as 'échancre glénoïdienne'. In addition, the notch is mentioned by Frazer (1958), who stated that the position of the notch indicates the line of the junction between the 'coracoid' and the 'scapular' parts of the glenoid cavity.

The present study was undertaken to provide information about the prevalence of the glenoid notch, how this notch will affect the shape of the glenoid cavity, and whether a sex or side preference for the presence of the notch exists, and also to examine the relation of the glenoid notch to the glenoid labrum.

### MATERIAL AND METHODS

For this investigation 236 unselected scapulae (118 female, 118 male) collected between 1985 and 1996 at the Anatomical Institute of the Rheinisch-Westfälischen Technischen Hochschule (RWTH) in Aachen, were examined. These scapulae came exclusively from German individuals in the area of Aachen. The age and sex of each pair of scapulae were known. Contour drawings of the articular facet were produced by hand with the aid of paper stencils (Zweckform selfadhesive labels) (Prescher & Klümpen, 1995) which could then be examined qualitatively for the occurrence of the glenoid notch. Scapulae with clearly recognisable degenerative, metastatic or traumatic changes involving the glenoid cavity were not included. We also examined 30 unmacerated fixed (4% buffered formalin) or unfixed

scapulae in order to determine the relationship between the glenoid notch and the glenoid labrum.

RESULTS

*Prevalence of the glenoid notch*

129 scapulae (55%) showed a more or less recognisable glenoid notch at the anterior margin of the glenoid cavity and because of this were pear-shaped (Fig. 1a, b). Altogether, 61 female scapulae (47%) and 68 male scapulae (53%) of all scapulae with a notch showed a glenoid notch. The difference between the sexes is not significant (Fig. 2). 107 scapulae (45%) showed no notch and were of oval form (Fig. 1c). Of these 107 scapulae 57 were female (53%) and 50 male (47%). The difference between the sexes is again not significant (Fig. 2).

*Side differences*

Examination of the right–left symmetry of the glenoid notch revealed 77 (65%) symmetrically shaped scapular pairs. There was a small but nonsignificant sexual dimorphism: 32 of the scapular pairs (42% of all symmetric pairs) were female and 45 (58%) male. 41 (35%) scapular pairs showed asymmetric glenoid cavities. Here a clear difference between the sexes existed: 27 female pairs (66%) and 14 male pairs (34%) of all asymmetric scapulae (Fig. 3). 77 (65%) of all scapular pairs showed symmetric glenoid cavities. These symmetric pairs could be divided into

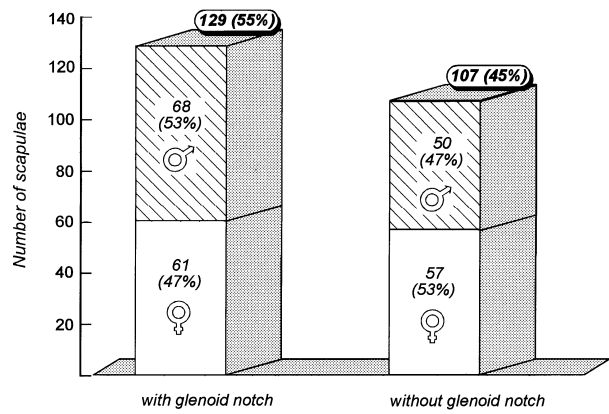


Fig. 2. Histogram showing the prevalence of the glenoid notch with sex differentiation. (n = 236 scapulae).

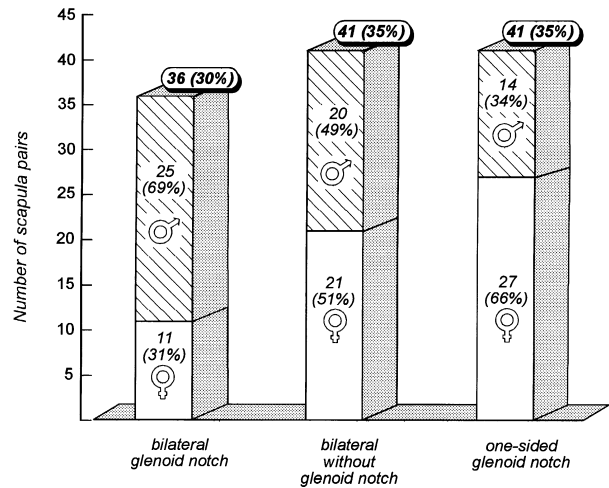


Fig. 3. Histogram showing the side-differences in the occurrence of the glenoid notch with sex differentiation. (n = 118 scapula pairs).

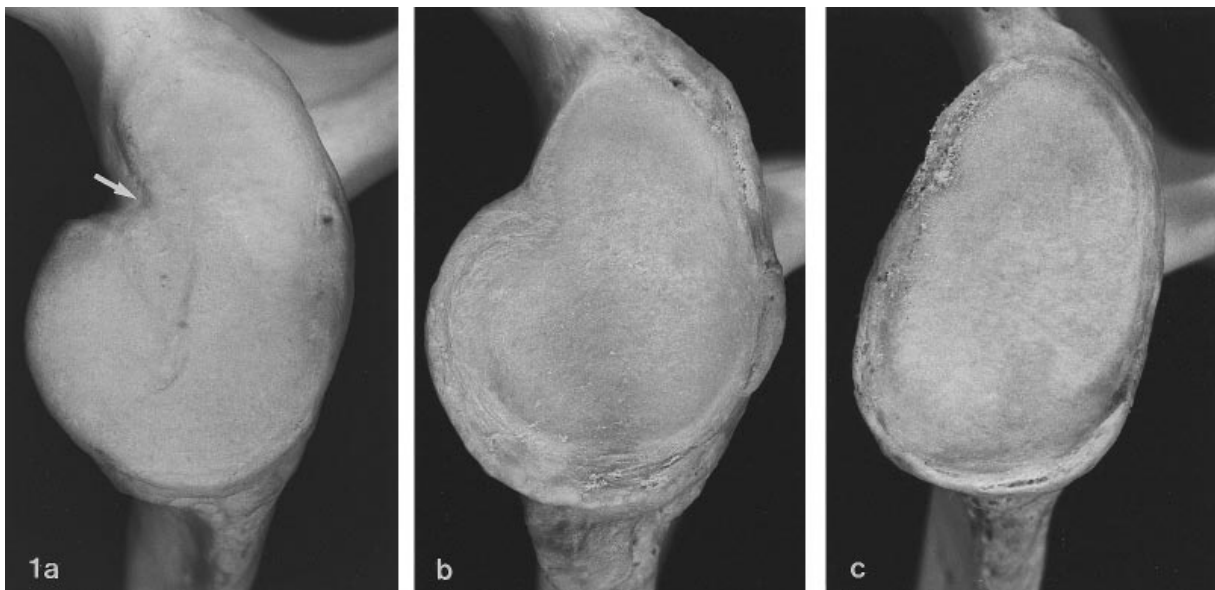


Fig. 1 (a) Glenoid cavity (pear-shaped) with a distinct glenoid notch at the anterior margin (arrow). (b) Glenoid cavity (pear-shaped) with slight glenoid notch. (c) Glenoid cavity (oval) without glenoid notch.

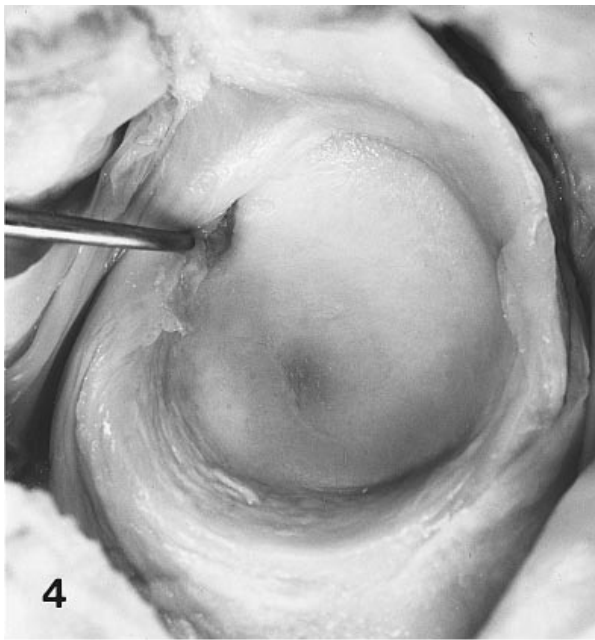


Fig. 4. Glenoid cavity with a pronounced recess between the anterior margin of the cavity and the glenoid labrum.

Fig. 5. Glenoid cavity of a young child (Infans II, archaeological specimen from 'Gut Melaten', Aachen) showing the junction between 'coracoid' and 'scapular' parts of the glenoid cavity slightly above the glenoid notch (arrow).

36 (30%) pear-shaped (with glenoid notch) and 41 (35%) oval-shaped (without glenoid notch) forms. The scapular pairs with a symmetric pear-shaped articular facet (with a glenoid notch) exhibited the clearest difference of the sexes: 11 female scapular pairs (31% of all symmetric scapulae with a notch as against 25 male scapular pairs (69% of all symmetric scapulae with a notch) (Fig. 3). The scapular pairs

with symmetric oval-shaped sockets showed no clear difference between the sexes: 21 female pairs (51%) and 20 male pairs (49%) of all symmetric scapulae without notch (Fig. 3).

#### *Unmacerated scapulae*

Of the 30 unmacerated scapulae, 14 (46.7%) exhibited a typical glenoid notch. If the notch was present the glenoid labrum was not attached in this area to the anterior margin of the glenoid cavity. A small recess of the articular cavity was regularly found at the glenoid notch. This small synovial sac undermined the glenoid labrum and was best seen with the labrum lifted and pulled aside (Fig. 4).

#### DISCUSSION

This study shows that the glenoid notch (*incisura acetabuli*) is found in 55% of examined scapulae. It is consequently a common finding and not a rare anatomical variant. When the notch is present, the shape of the glenoid cavity can be described as pear-shaped or as inverted comma-shaped. When it is absent, the cavity is round or oval shaped. The pear-shaped variant (type 1) occurs with a frequency of 55% of all cases and the oval-shaped variant (type 2) with a frequency of 45%. Between the 2 well developed representative shapes, (Fig. 1*a, c*) numerous transitional forms can be found (Fig. 1*b*). The types of shape do not show any sexual dimorphism. In addition, it was found that 77 scapular pairs (65%) had symmetric glenoid cavities, whereas 41 scapular pairs (35%) were asymmetric. The latter were more often female, whereas the symmetric pear-shaped glenoids were predominantly male (69%). There was no priority of side for the glenoid notch, so that an influence of handedness on the shaping of the glenoid cavity is unlikely.

We have shown that the glenoid labrum in the area of the notch is not fixed to the bony margin of the glenoid cavity (Fig. 4) but bridges the notch itself. In many cases a small recess of the joint cavity projects between the glenoid labrum and the anterior margin of the glenoid cavity (Fig. 4). This could be termed the anterior sublbral recess. Such an attachment of the labrum could make the shoulder joint less resistant to dislocating forces. Clinical observations support this supposition, as labral tears and avulsions (Bankart lesions) usually occur at the anterior margin of the glenoid cavity (Bankart, 1923, 1938; Adams, 1948). It can be supposed that the glenoid notch and the nonattachment of the glenoid labrum in this region is a *locus minoris resistentiae* and predisposes to such

Bankart lesions. Furthermore, the normal non-attachment at the glenoid notch must not be misinterpreted as a Bankart lesion.

At present there is no evident explanation for the presence of a glenoid notch. Whether the position of the glenoid notch is related to that of the tendon of the subscapularis muscle, which crosses the shoulder joint at this point, remains speculative. It could be suggested that by pressure on the anterior margin of the glenoid cavity with subsequent atrophy of the bone, a strong tendon of this muscle could lead to the development of a glenoid notch and, consequently, to a local detachment of the glenoid labrum with the subsequent development of a synovial recess between the labrum and the anterior glenoid margin. It is less likely that the tendon of subscapularis minor shapes of the glenoid notch, as that tendon is usually completely fused with the tendon of subscapularis major.

The assumption of Frazer (1958) that the glenoid notch indicates the line of the junction between the 'coracoid' and the 'scapular' parts of the glenoid is also not convincing. The junction between these 2 developmental parts of the glenoid cavity is located a few millimetres above the glenoid notch (Fig. 5).

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