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GLENOHUMERAL MALALIGNMENT IN THE HEMIPLEGIC SHOULDER

An Early Radiologic Sign

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ABSTRACT. A new radiologic sign is described which seems to diagnose an early presubluxation phase of glenohumeral malalignment in hemiplegic shoulders. The sign consists of a V-shaped widening of the upper part of the space between the humeral head and the glenoid cavity on anteroposterior shoulder films in the erect position. Twelve of 14 patients showing this sign went on to develop chronically painful shoulders, and four of them developed radiologically evident subluxation within several months. The sign may be helpful in diagnosing shoulder pathology following stroke at an early stage, when orthotic measures may still have preventive value.

Key words: Hemiplegic, shoulder subluxation, radiologic examination, early diagnosis

Subluxation or full dislocation of the shoulder joint is a common and troublesome complication of hemiplegia. It often develops insidiously over a period of months after stroke, giving rise to chronic pain which thereupon frustrates all efforts to rehabilitate the weak upper extremity (1, 3, 5, 6). Various orthotic (8, 9) and surgical (1) treatments have been tried, but none seems to be completely effective in fully developed subluxation.

Diagnosis of shoulder subluxation in hemiplegia has so far relied upon the classic radiologic findings of glenohumeral malalignment in the vertically positioned patient (5). This malalignment reflects an existing subluxation and cannot be considered an early sign. The earlier diagnosis of the pathologic process leading to subluxation seems a worthwhile goal, since it may make possible more effective preventive measures.

We describe here an early radiologic sign which may be useful in such early diagnosis and treatment.

The sign and its anatomic basis

Subluxation of the hemiplegic glenohumeral joint develops caudally as a result of the pull of gravity on the humerus against weakened abductor muscles (4, 5). The caudal drift of the humeral head is resisted at first by the glenoid labrum at the inferior rim of the glenoid cavity. Since the glenoid cavity covers only a third of the humeral head (2), the impingement of head on labrum acts as a fulcrum, and the caudal pull of gravity on the humerus causes it to rotate about that point, resulting in increased humeral shaft adduction and a visible abduction of the humeral head from the glenoid cavity (see Fig. 1). This abduction is maximal at the top of the glenohumeral joint and minimal at the bottom, resulting in a V-shaped space between humeral head and glenoid cavity. These changes, shown in Fig. 2, occur while the humeral head is still in the joint, before any subluxation is radiologically evident. It is only at a later stage, mostly when the rotator cuff is breached (6, 7), that the humeral head migrates caudally, passing the glenoid labrum and producing a symmetrical widening of the space of the joint (Fig. 3), and eventually comes to rest in a subluxated position (Fig. 4) or, sometimes, in a fully dislocated one.

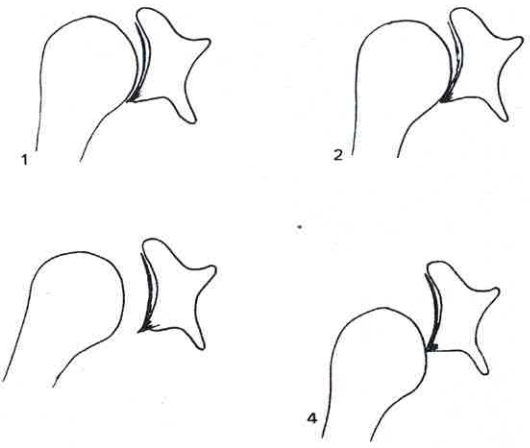

Fig. 1. 1. Caudal drift of the humeral head (V-shaped space). 2. Adduction of humeral shaft. 3. Symmetrical widening of the joint space. 4. Subluxation of the head of humerus.

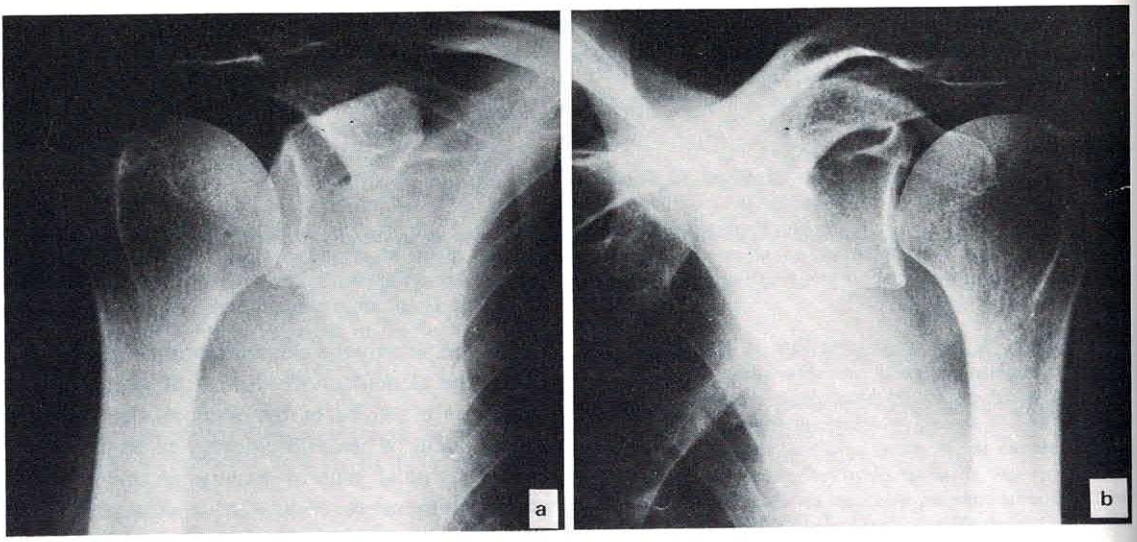

Fig. 2. V-shaped space. (*a*) The right side where this space has made its appearance. (*b*) Normal left side.

MATERIALS AND METHODS

Fifty consecutive hemiplegic patients hospitalized in our department were reviewed for the purposes of this study. Forty of them underwent at least one anteroposterior shoulder X-ray in the erect position, and these constituted the basis of our study. They included 21 women and 19 men, 21 were right hemiplegics and 19 were left. Ages ranged form 38 to 85, with a mean of 65.85 (±8.55).

Patients were followed for periods of two to ten months in our institution, and final clinical status was ascertained between four and eleven months after the onset of hemiplegia.

All shoulder X-rays in the erect position were reviewed and classified as follows:

1. Normal.
2. V-shaped presubluxation sign.
3. Classical findings of subluxation or dislocation.

All these radiologic examinations were first performed early in the course of hospitalization. Thirty-seven of the 40 patients were X-rayed within a month of admission. Patients were classified clinically at the end of their hospitalization as to presence or absence of disabling shoulder pain, with or without evidence of distrophic signs.

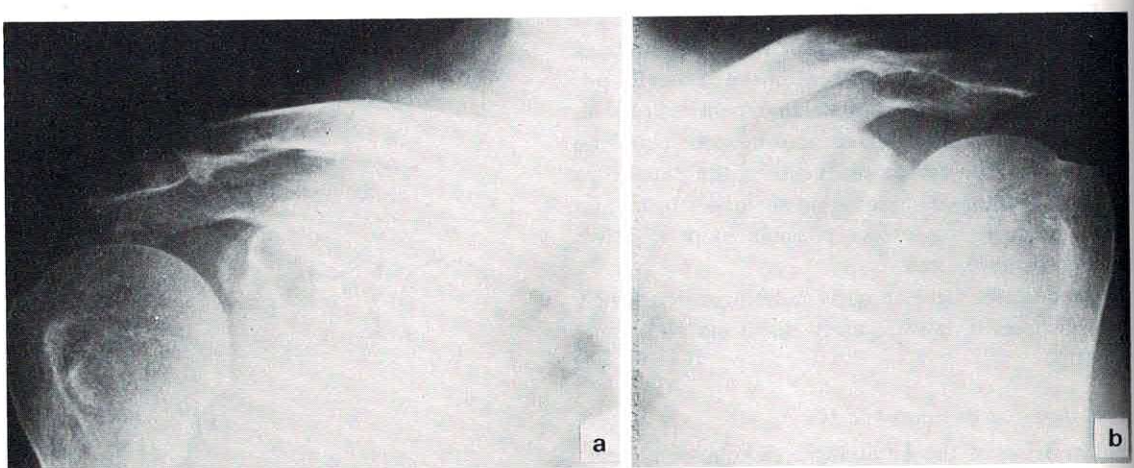

Fig. 3. Symmetrical widening of the space of the joint. (*a*) The widening seen on the right side. (*b*) Normal left side.

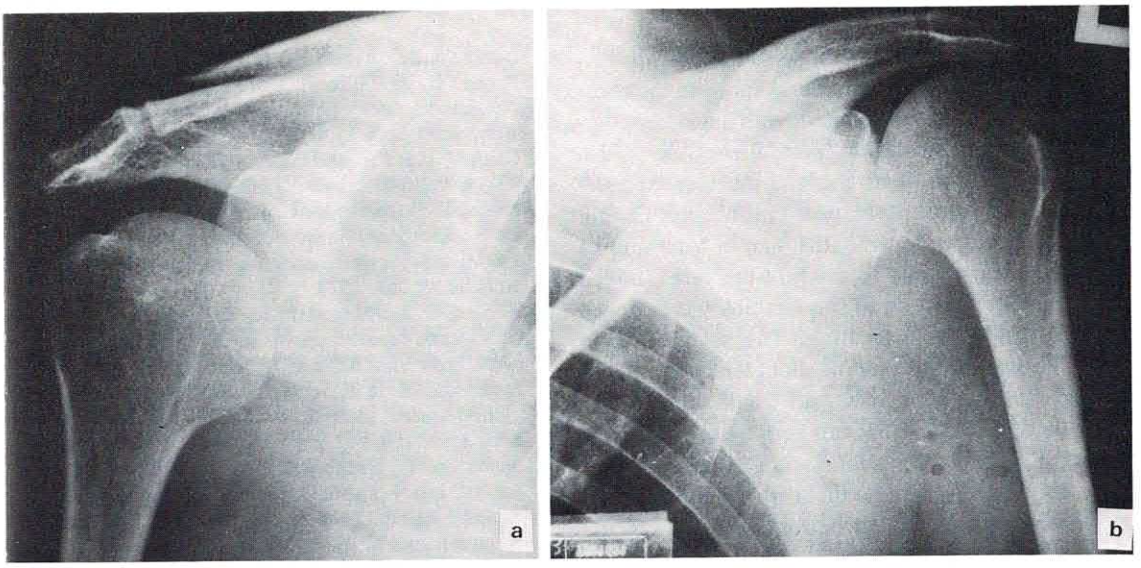

Fig. 4. Subluxation. (*a*) Subluxation seen on right side. (*b*) Normal left side.

RESULTS

A single radiographic examination of the shoulder was performed in 33 of the 40 patients studied. Seven had repeated examinations.

Table I shows the correlation between the radiologic findings and the development of a chronically painful shoulder in the 33 patients with a single radiologic examination. It demonstrates a good but imperfect correlation between abnormal radiologic findings early in the hospitalization and the development of a chronically painful shoulder later in the course of hospitalization. Eleven of the 14 with normal shoulder X-rays in the vertical position remained free of pain, compared with only three of the nine with radiographic evidence of frank subluxation or dislocation, and only two of the ten with the X-ray sign of presubluxation. The difference between the group with normal X-rays and those with the V-shaped glenohumeral space is highly significant ($\chi^2=8.1$, $p<0.01$). In this material, the V-shaped sign of presubluxation shows as strong an association with shoulder pain as does the evidence of frank subluxation.

Table I. *Association between initial radiologic and later clinical findings in 33 hemiplegics with single X-ray examinations in erect position*

	Chronic pain			
	Yes	No	Total	
Normal shoulder film	3	11	14	$\chi^2=8.1$
V-shaped glenohumeral space	8	2	10	D.F.=1
Subluxation or dislocation	6	3	9	$p<0.01$
Total	17	16	33	

The seven patients with repeated radiographic examinations of the shoulder provide added evidence for the value of this sign. Three of these patients had a first examination which was normal. One of them remained normal on second examination and remained painless. The other two developed chronic painful shoulders. The repeated X-ray of one of them showed the presubluxation sign, while that of the other showed frank subluxation. The other four patients with repeated X-rays showed the presubluxation sign on first examination. All four developed painful shoulders, and all of them showed frank subluxation on follow-up X-ray.

If later development of chronic shoulder pain is taken as the criterion, the specificity of the V-shaped radiologic subluxation sign is 12/14 or 0.86, compared with 6/9 or 0.67 for frank subluxation, in our material. The sensitivity of the two radiologic findings together is 18/23 or 0.78.

DISCUSSION

Our principal finding is that the radiologic appearance of a V-shaped glenohumeral space in the erect position is closely associated with later development both of a chronically painful shoulder and a frank subluxation. Twelve of the fourteen patients showing this sign developed chronically painful shoulders within a few months, and at least four of these twelve (the only four who were re-examined radiologically) went on to show radiologic evidence of subluxation or dislocation. The association of later development of painful shoulders was no less strong with this sign than with frank subluxation. We believe therefore that this sign indeed indicates an early stage in the subluxation process, and it seems reasonable to hope that orthotic intervention at this stage should have a better chance of success that it would later on.

Although we share the common view that subluxation is the principal cause of chronically painful shoulder in hemiplegics (1, 5, 6), it may well be that some additional factor is involved. This possibility is indicated by the fact that three of our cases of frank subluxation did not suffer from chronic pain. It is conceivable that these three patients did not suffer the same kind of rotator cuff injury that is common in hemiplegic shoulder subluxation (6, 7).

Arthrography was not performed in our series. It may be justified in similar cases in the future.

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