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# The sourcil sign: a useful finding on plain X-ray?

Chris Smith\*, Rupen Dattani<sup>†</sup>, Victoria Deans<sup>‡</sup> & Steve Drew<sup>‡</sup>

\*Warwick University-Clinical Sciences Research Institute, Coventry, UK

<sup>†</sup>Department of Orthopaedics, Royal Surrey Hospital, Guilford, UK

<sup>‡</sup>Department of Orthopaedics, UHCW, Coventry, UK

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## Conflicts of Interest

None declared

## Correspondence

Chris Smith, Warwick University-Clinical Sciences Research Institute, Clinical Science Building, University Hospitals Coventry and Warwickshire, Clifford Bridge Road, Coventry CV2 2DX, UK.

Tel: +44 2476 968618.

Fax: +44 2476 9698617.

E-mail: christopher.d.smith@warwick.ac.uk

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## ABSTRACT

**Background** The radiographic finding of the 'sourcil sign' from plain X-ray has previously been suggested to be an indicator of rotator cuff pathology. However, little evidence exists to support this hypothesis. We set out to clarify whether plain X-rays changes are a useful adjunct for the diagnosis of rotator cuff disease.

**Methods** The radiographs of 175 patients presenting to an orthopaedic shoulder clinic with shoulder pain were evaluated for the presence of the 'sourcil sign' by a single observer, blinded to the patient's diagnosis. A second observer, blinded to the radiological findings, examined the patient's medical notes to determine the diagnosis. The patients were divided into age groups of each decade.

**Results** Sensitivity, specificity, positive predictive value and negative predictive value were all poor for the radiological signs as predictors of rotator cuff pathology, regardless of age. The incidence of the sourcil sign did not correlate with impingement syndrome, rotator cuff tears or age.

**Conclusion** The results obtained demonstrate that the sourcil does not aid the diagnosis when seen.

## INTRODUCTION

Rotator cuff impingement and tears are common disorders presenting to the general orthopaedic surgeon and the shoulder specialist alike. After clinical examination, plain radiographs should be the first line of investigation for patients presenting with acute or chronic shoulder pain. This may help to rule out differential diagnoses such as calcifying tendinitis, fracture, arthritis and neoplasm. Occasionally, the radiograph will demonstrate the so-called 'sourcil' sign or sclerosis on the under surface of the acromion, thought to be caused by pressure from the rotator cuff [1–3]. Sourcil is taken from the French for eyebrow and appears as a white 'eyebrow' above the humeral head (Fig. 1).

Classical teaching has associated the sourcil sign with rotator cuff pathology (impingement syndrome, tendinopathy, partial and full thickness rotator cuff tears) [1–4]. Recent reports have also shown a strong association with impingement syndrome in small groups of patients [5]. However, some studies have reported that acromial sclerosis is simply associated with old age [6, 7]. All of these studies have involved small numbers of patients and there is no clear evidence to guide the clinician with respect to the usefulness of the sourcil sign when seen on plain X-ray.

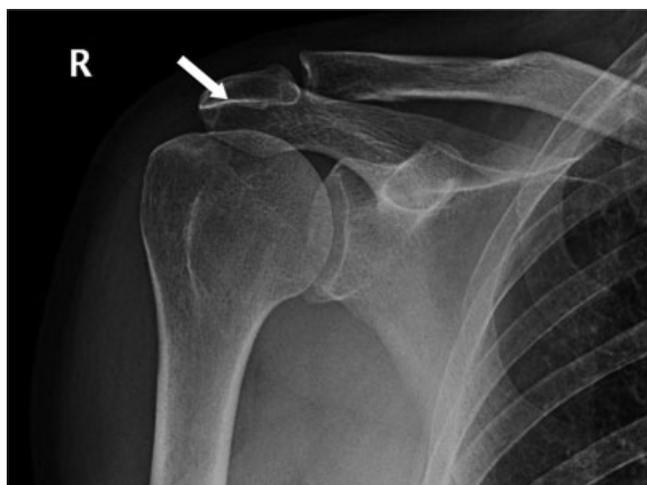
Therefore, the present study aimed to clarify whether there is an association between the sourcil sign with impingement syndrome and rotator cuff tears.

## MATERIALS AND METHODS

This was a retrospective cohort study involving a total of 175 anteroposterior (AP) X-rays. To obtain these, radiographs of consecutive adult patients presenting to an orthopaedic shoulder clinic were examined. Patients with inadequate radiographs or notes, fractures that obscured the view of the glenohumeral joint, metalwork around the shoulder joint, those with pathological bone abnormalities and repeat X-rays were not included in the study. All radiographs were archived on a picture archiving and communications system (PACS).

The 175 radiographs were evaluated for the presence of the sourcil sign (defined as an increase in sclerosis on the under surface of the acromion compared to the superior acromial cortex) by a single orthopaedic surgeon who was blinded to the patient's diagnosis. In practice, the PACS system was used to adjust the contrast of the radiograph so that the entire image was blackened. The contrast was then slowly increased and a positive sourcil sign was recorded if the inferior cortex of the acromion came in to view first compared to the rest of the acromion.

A second observer who was blinded to the radiological findings examined the patient's medical notes to determine the diagnosis based on a clinical diagnosis made by a consultant shoulder surgeon with other diagnostic imaging [magnetic resonance imaging (MRI) or ultrasound (US)] and/or operative findings. For a positive diagnosis, the patient would have to demonstrate strong clinical signs or have clinical signs consistent with imaging



**Fig. 1** AP radiograph of left shoulder demonstrating the 'sourcil' sign (white arrow) in a patient with impingement syndrome.

and/or operative findings. Therefore, only symptomatic patients were diagnosed with rotator cuff pathology, and patients with incidental positive imaging findings were not diagnosed. The time period from the original referral for radiograph to the time of the study was purposefully 18 months. This allowed time for patients to be correctly diagnosed from the original point of referral. Old notes from previous consultations were also available.

The patients were then divided into two distinct groups: those with rotator cuff pathology and those without. Contingency tables (2 × 2) were constructed to allow specificity, sensitivity, positive predictive values (PPV) and negative predictive values (NPV) to be calculated for the sourcil sign as a predictor of rotator cuff disease. The difference between groups were analysed using an unpaired Student's *t*-test with statistical significance set at *p* < 0.05.

**RESULTS**

The mean age for the patients at the time of X-ray was 59 years (range 19 to 94 years). One hundred and thirty-five patients were over the age of 40 years at the time of X-ray. Table 1 shows the primary diagnosis for the patients.

In total, 35 (20%) patients were diagnosed with impingement syndrome and 44 (25.1%) were known to have a rotator cuff tear. The diagnosis of impingement was made by US in 46%, clinically in 25%, by MRI in 17% and intra-operatively in 12%. A clinical diagnosis was made by a consultant shoulder surgeon in a patient who had a positive Hawkins test and responded positively to a sub-acromial local anaesthetic and steroid injection so that further investigation and intervention were not required.

The mean age for this group with rotator cuff pathology was 61 years of age with 58% of the patients being female. There were a total of 96 patients who did not have rotator cuff pathology. The mean age in this group was 60 years of age and 56% were female.

The sourcil sign was present in 32 (18.2%) out of the 175 radiographs examined. Only seven (21.9%) of these patients with a positive sourcil sign had a clinical diagnosis of impingement

syndrome and seven (21.9%) had a diagnosis of a rotator cuff tear (Table 2).

The sensitivity, specificity, PPV and NPV were calculated for the sourcil sign in rotator cuff pathology in general (both impingement and rotator cuff tears). The sensitivity, specificity, PPV and NPV were also calculated for the sourcil sign and impingement syndrome and rotator cuff tears individually (Table 3).

The mean age for a patient with impingement syndrome was 55.9 years and that for a patient with a rotator cuff tear was

**Table 1** Primary diagnosis for patients referred for shoulder radiograph

Primary diagnosis	Total number	Percentage
Rotator cuff tear	44	25.1
Impingement	35	20.0
Glenohumeral joint osteoarthritis	35	20.0
Acromioclavicular joint osteoarthritis	24	13.7
Instability	24	13.7
Frozen shoulder	5	2.9
Cuff tear arthropathy	4	2.3
Brachial plexus injury	1	0.6
Rheumatoid arthritis	1	0.6
Septic arthritis	1	0.6
Ankylosed shoulder	1	0.6

**Table 2** Association of sourcil sign and with rotator cuff pathology

	Impingement syndrome	Rotator cuff tear	Neither
Total (% of total numbers)	35 (20.0%)	44 (25.1%)	96 (54.9%)
Sourcil +ve (% of sourcil +ve)	7 (21.9%)	7 (21.9%)	18 (56.2%)
Sourcil -ve (% of sourcil -ve)	28 (19.6%)	37 (25.8%)	78 (54.6%)

**Table 3** Sensitivity, specificity, positive predictive value and negative predictive value for the sourcil sign in diagnosing rotator cuff pathology

	Sourcil for either rotator cuff tear or impingement	Sourcil for impingement	Sourcil for rotator cuff tear
Sensitivity (95%CI)	0.18 (0.12–0.24)	0.20 (0.11–0.33)	0.16 (0.08–0.26)
Specificity	0.81 (0.76–0.86)	0.82 (0.80–0.85)	0.81 (0.78–0.85)
Positive predictive value	0.44 (0.29–0.59)	0.22 (0.11–0.36)	0.22 (0.11–0.37)
Negative predictive value	0.54 (0.51–0.58)	0.80 (0.78–0.84)	0.74 (0.72–0.77)

**Table 4** Association of sourcil sign with rotator cuff pathology in the over 40 years population

Over 40 years	Impingement syndrome	Rotator cuff tear	Neither
Total (% of total numbers)	31 (20.1%)	43 (29.1%)	74 (50.0%)
Sourcil +ve (% of sourcil +ve)	7 (25.9%)	7 (25.9%)	13 (48.2%)
Sourcil -ve (% of sourcil -ve)	24 (19.8%)	36 (29.8%)	61 (50.4%)

65.7 years. The mean age of the patient with a positive sourcil sign on their radiographs was 63.2 years compared to 57.8 years with those without a sourcil sign ( $p = 0.15$ ).

The incidence of the sourcil sign in the over 40 years age group is presented in Table 4. The sensitivity, specificity, PPV and NPV were not significant in this age group for any of the radiographic findings.

Figure 2 represents the incidence of the sourcil sign and shoulder pathology for each decade. The incidence of clinically significant rotator cuff tears increases up to the seventh decade. The incidence of impingement syndrome peaks in the fourth and fifth decades. The incidence of the sourcil sign does not correlate with age.

**DISCUSSION**

The diagnosis of shoulder impingement syndrome is usually made on a clinical basis and perhaps with the aid of a diagnostic subacromial local anaesthetic injection [8]. Plain radiographs are essential in the initial workup of a patient presenting with shoulder pain. The three recommended radiographic views are the AP view with the arm in 30° of external rotation, the supraspinatus outlet view and the axillary view [9]. It is well documented that migration of the humeral head seen on plain X-ray is a sign of significant rotator cuff tears [10–12]. Other findings that have been suggested to indicate rotator cuff pathology include the

presence of subacromial bony spurs, degenerative changes in the greater and lesser tuberosities as well as the acromioclavicular joint, narrowing of the acromiohumeral distance and a change in the morphology of the acromion [6, 13–16]. Both US and MRI are demonstrated to be a much more accurate imaging modality of the rotator cuff [17–20].

The present study has demonstrated that the sourcil sign as seen on a radiograph of the shoulder cannot reliably be used to diagnose impingement syndrome or rotator cuff pathology. None of the values presented suggest that the radiological signs are helpful to the clinician when diagnosing impingement syndrome.

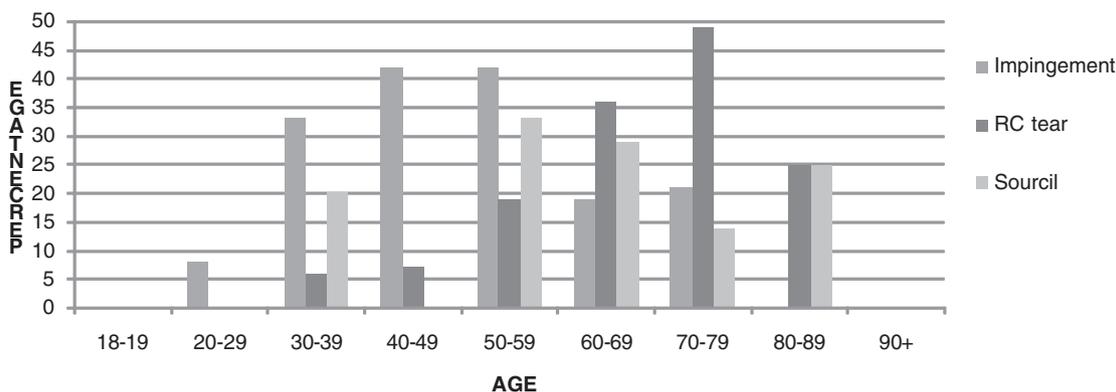
Impingement itself increases up to the fourth and fifth decades and then slowly declines. However, a useful correlation between the sourcil sign and impingement syndrome was not found in any age group. It must be remembered that the patients diagnosed as having rotator cuff pathology were symptomatic. The reduction in the number of rotator cuff tears over the age of 80 years represents only those that are symptomatic because it is well documented that the number of asymptomatic tears increases with age.

The results obtained also demonstrate that the incidence of the sourcil sign is not related to age. A sceptical view would be that the sourcil sign is related to the absolute direction of the radiograph and is essentially an artefact. The radiographs in the present study were not standardized, which does reflect the conditions that most orthopaedic units practice within. Alternatively, it could be related to the curvature of the acromion itself, the morphology of which has been classified into three types, with an increasing likelihood of impingement syndrome with ascending type [21, 22].

**Conclusion**

The present study has used a large number of radiographs to determine the usefulness of the sourcil sign for diagnosing rotator cuff pathology. The results obtained demonstrate that the sourcil

**Graph of age group against incidence of clinical and radiographical findings (expressed as a percentage within each age group).**



**Fig. 2** Incidence of the sourcil sign and shoulder pathology for each decade.

sign is not indicative of impingement syndrome or rotator cuff tears. The incidence of the sourcil sign peaks in the fourth and fifth decades. Plain radiographs are necessary in the assessment of patients with shoulder pain; however, the sourcil sign cannot be relied upon to aid in the diagnosis. MRI and US should be used to further investigate patients with suspected early rotator cuff pathology.

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