

Is the existence of sublabral foramen age-related?

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SUMMARY

Although a sublabral foramen does not require treatment, its association with age, sex or side remains unknown. Therefore, the aim of the current study was to investigate the incidence of a sublabral foramen and age, sex and side in a British population. A total of 140 shoulders (30 male and 40 female cadavers, with an average age of 81.5 years), were obtained from the Centre for Anatomy and Human Identification University of Dundee, in accordance with the Human Tissue (Scotland) Act 2006. All muscles and blood vessels surrounding the glenohumeral joint, as well as the fibrous capsule, were inspected and then removed to expose the glenoid fossa with the glenoid labrum attached. The gender, age, side and presence of a sublabral foramen were double-entered into the Statistical Package for Social Sciences (Version 21; IBM, Armonk, NY, USA). Chi Square tests were conducted to determine statistical significance, which was set at $P < 0.05$. A sublabral foramen was observed in 28.6% ($n=40$) of shoulders, being marginally more in females than males. A sublabral foramen was more common in elderly individuals (>70 years old), no significant difference being observed between the presence of a sublabral foramen and age. It was also more common on the right than the left side in both genders with no significant difference between the presence of a sublabral foramen and sex or side. The current observations confirm that a sublabral foramen was more common in older individuals, but was not significantly different from other age groups.

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Key words: Sublabral foramen – Glenoid labrum – Shoulder joint

INTRODUCTION

A sublabral foramen is defined as complete thickness separation of the glenoid labrum from the underlying bone usually occurring in the anterosuperior aspect the glenoid (Bain et al., 2012), with an incidence between 7-26% (Williams et al., 1994; Pfahler et al., 2003; Bain et al., 2012; Park et al., 2000; Smith et al., 2008; Wilson et al., 2013). Barthel et al. (2003) describe a sublabral foramen as a physiological variant, while Schulz et al. (2002) reported it to be asymptomatic clinically and should be considered as a variant of the anterosuperior capsulolabral complex. A sublabral foramen can be seen during arthroscopy or MRI of the shoulder; however, it might be misdiagnosed as a glenoid labrum tear. Both Schulz et al. (2002) and Barthel et al. (2003) add that it was predominantly found in older individuals, suggesting its presence is age-related, being trauma induced when present in younger individuals. Schulz et al. (2004) later reported that the presence of a sublabral foramen was not correlated with joint instability.

The association between sublabral foramen and sex, age or side is still unknown; therefore, the current study aims to investigate the incidence of a sublabral foramen in relation to age, sex and side in a British population.

MATERIAL AND METHODS

A total of 220 cadaveric shoulders from 58 males and 59 females, with a median age of 82 years (range, 53-102 years), were obtained from the Centre for Anatomy and Human Identification, Uni-

Submitted: 15 September, 2018. *Accepted:* 5 December, 2018.

versity of Dundee: they were obtained in accordance with the Human Tissue (Scotland) Act 2006. Macroscopically normal shoulder joints were selected for this study: i.e., shoulders with signs of previous surgery, fracture, pathology or variation of the anterosuperior aspect glenoid labrum, including Buford complex, were excluded.

Consequently, 140 shoulders from 30 male and 40 female cadavers, with an average age of 81.5 years (range, 53-101 years), were examined in the study.

All muscles and blood vessels surrounding the glenohumeral joint, as well as the fibrous capsule, were inspected and then removed to expose the glenoid fossa with the glenoid labrum attached. A sublabral foramen was defined as an isolated complete detachment of the anterosuperior aspect of the capsulolabral complex, which was confirmed by a probe (Schulz et al., 2004). A sublabral foramen was considered absent when the glenoid labrum was found to be attached throughout the whole anterosuperior glenoid rim (Kanatli et al., 2010).

Specimens were allotted to one of three groups according to their age: group A, aged 50-70 years old; group B, aged 71-85 years old; group C, aged 86-> 90 years old.

Chi square tests were used to investigate the potential correlation between age, sex and side of individual with the existence of a sublabral foramen (Nataasis et al., 2016). All analyses were conducted using the Statistical Package for Social Sci-

ences (Version 21; IBM, Armonk, NY, USA), with a P value <0.05 considered to be statistically significant.

RESULTS

A sublabral foramen was observed in 28.6% (n=40) of shoulders, being marginally more prevalent in females (21 shoulders) than males (19 shoulders) (Fig. 1). A sublabral foramen was more common in older individuals (>70 years old) with no significant difference being observed between the presence of a sublabral foramen and all age groups (groups A – C) $\chi^2 = 1.593$, $p = .521$ (Table 1, Fig. 2). It was also more common on the right than the left side in both genders, with no significant difference observed between the presence of a sublabral foramen and sex $\chi^2 = 0.469$, $p = .571$, or side $\chi^2 = 0.560$, $p = .579$ (Tables 2, 3).

DISCUSSION

The current study was undertaken to investigate the relation between the presence of a sublabral foramen and age, sex and side within a single population. The current study observed that the presence of a sublabral foramen was more common in older individuals, but not significantly so, supporting the reports of Schulz et al. (2002) and Barthel et al. (2003): these authors also stated that a sublabral foramen was a physiological variant that is asymptomatic clinically. Its presence is therefore

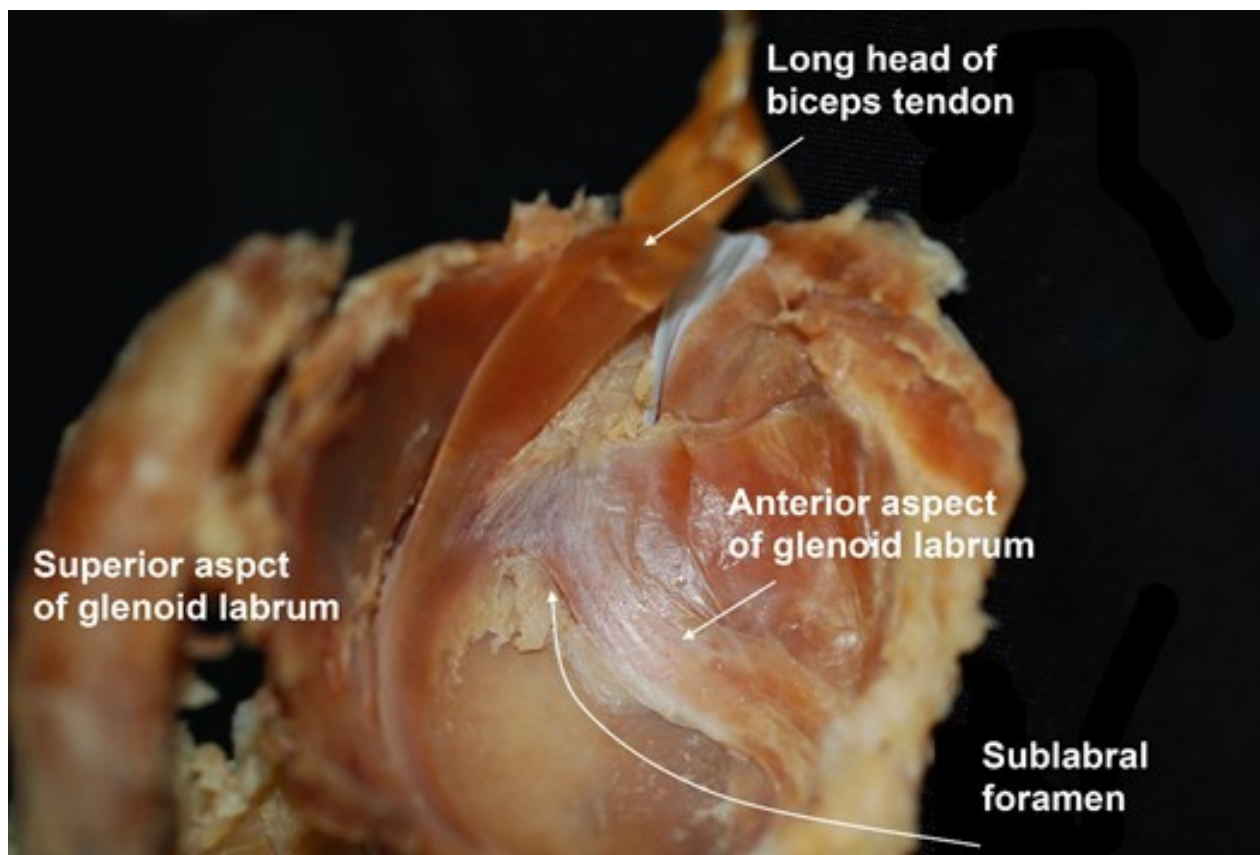


Fig 1. Right shoulder showing a sublabral foramen.

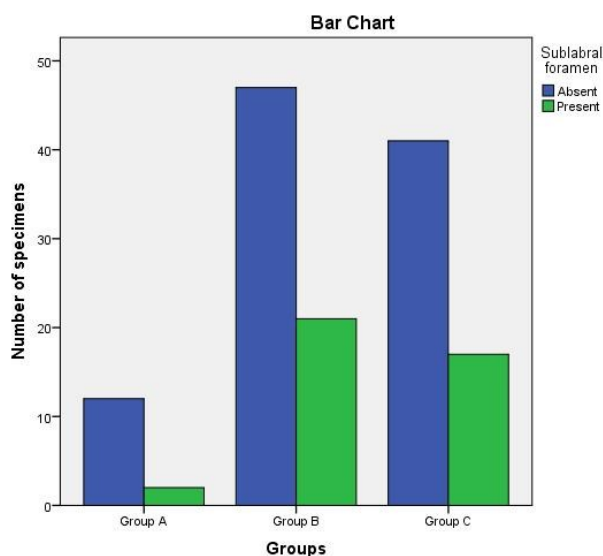


Fig 2. The distribution of a sublabral foramen in different age groups.

suggested to be an age-related development; when present in younger individuals it is probably trauma-induced. The presence of a sublabral foramen is not correlated with joint instability (Schulz et al., 2004); however, Rao et al. (2003) are of the view that a sublabral foramen is positively associated with fraying of the anterosuperior part of the glenoid labrum, an abnormal superior glenohumeral ligament, and an increase in passive internal rotation of the arm at 90° of shoulder abduction, whereas Ilahi et al. (2002) and Kanatli et al. (2010) observed that the incidence of SLAP lesions was significantly higher in shoulders with a sublabral foramen and a Buford complex than in other shoulders.

Several studies (Barthel et al., 2003; Rao et al., 2003; Ilahi et al., 2002; Pfahler et al., 2003) have

Table 1. The distribution of a sublabral foramen in different age groups.

Sublabral foramen	Age			Total
	Group A (age 50 -70)	Group B (age 71 – 85)	Group C (age 86 - >90)	
Number	12	47	41	100
Absent % within age group	85.7%	69.1%	70.7%	71.4%
Absent % of Total	8.6%	33.6%	29.3%	71.4%
Number	2	21	17	40
Present % within age group	14.3%	30.9%	29.3%	28.6%
Present % of Total	1.4%	15%	12.1%	28.6%
Number	14	68	58	140
Total % within age group	100%	100%	100%	100%
Total % of Total	10%	48.6%	41.4%	100%

Chi square $P > 0.05$

reported that variation of the anterosuperior part of the glenoid labrum is more common than that of the anteroinferior (Eberly et al., 2002), posterior (Nourissat et al., 2014) or posterosuperior (Dewan et al., 2012) aspects. According to Barthel et al. (2003) the superior and anterosuperior aspects of the glenoid labrum show a wide range of morphological changes, while the posterior and inferior aspects are relatively consistent. Rao et al. (2003) support Barthel et al. (2003) reporting that three distinct variations can be observed in 13.4% (n=73) of shoulders, these being (1) a sublabral foramen (3.3%, n=18), (2) a sublabral foramen associated with a cord-like middle glenohumeral ligament (8.6%, n=47), and (3) absence of the anterosuperior aspect of the glenoid labrum associated with a cord-like middle glenohumeral ligament (1.5%, n=8). Shortt et al. (2009) observed variation of the anterosuperior aspect of the glenoid labrum in 24% (n=28) of individuals, these being a diminutive glenoid labrum (9%, n=7), a sublabral foramen (11%, n=8), and Buford complex (4%, n=3). More recently, Natsis et al. (2016) reported that the incidence of labral meniscoid folds were present in 62.7 % (n=37) of shoulders. These studies mainly discuss the morphology of the anterosuperior aspect of the glenoid labrum. In contrast, the current study is unique because it investigates the incidence of a sublabral foramen in relation to age, sex and side in a British population. One further advantage of the current study is that specimens with other variations of the anterosuperior aspect of the glenoid labrum, including Buford complex, absence of or a diminutive glenoid labrum were excluded. This increases the strength of the study decreasing the risk of bias.

The incidence of a sublabral foramen is variable: Park et al. (2000) observed it in 7% (n=3) of shoulders, Kanatli et al. (2010) in 7.67% (n=53), Smith et al. (2008) in 10% (n=1), Wilson et al. (2013) in 15% (n=16), Pfahler et al. (2003) in 16% (n=5), adding that its mean length is 7mm, and Bain et al. (2012) in 26% (n=5) of specimens. These differences in incidence are probably due to: (1) the

Table 2. The presence of a sublabral foramen and sex

Sublabral foramen	Sex		Total
	Male	Female	
Number	41	59	100
Absent % within sex	68.3%	73.8%	71.4%
Absent % of total	29.3%	42.1%	71.4%
Number	19	21	40
Present % within sex	31.7%	26.3%	28.6%
Present % of total	13.6%	15%	28.6%
Number	60	80	140
Total % within sex	100%	100%	100%
Total % of total	42.9%	57.1%	100%

Chi square $P > 0.05$

Table 3. The presence of a sublabral foramen and side.

Sublabral foramen		side		Total
		Right	Left	
Absent	Number	48	52	100
	% within side	68.6%	74.3%	71.4%
	% of total	34.3%	37.1%	71.4%
Present	Number	22	18	40
	% within side	31.4%	25.7%	28.6%
	% of total	15.7%	12.9%	28.6%
Total	Number	70	70	140
	% within side	100%	100%	100%
	% of total	50.0%	50.0%	100%

Chi square $P > 0.05$

methodology employed: it was noted that a lower incidence is associated with radiological assessment, such as MRI, and a higher incidence with gross dissection; and (2) the nature of the sample (cadaver or patient), number of samples, age, race and gender, these all being different between studies. A major advantage of the current study was the sample size (140 shoulders) and gross dissection: these two elements enhance the investigation decreasing the risk of bias. The current study agrees with Bain et al. (2000) that the incidence of the sublabral foramen is relatively high at 28.57% ($n=40$), being slightly more common in females than males (21 vs 19). It was also more common on the right side than the left in both genders, being more common on the right side, and in older individuals suggesting that it could be a physiological variant (Barthel et al., 2003).

Shortt et al. (2009) observed that variations of the anterosuperior aspect of the glenoid labrum, including diminutive glenoid labrum, sublabral foramen and Buford complex are significantly associated with the underlying glenoid morphology. All sublabral foramina in the current study were observed as complete separation of the anterosuperior aspect of the glenoid labrum from the underlying bone. Alashkham et al. (2017) have reported three types of glenoid notch severity; however, the correlation between a sublabral foramen and glenoid notch type is still unknown. Further study is therefore recommended to evaluate the association between a sublabral foramen and glenoid notch type.

Due to lack of the medical history of specimens in the current study, it was not possible to correlate the presence of a sublabral foramen and glenohumeral joint instability. Further study is recommended to determine if an association exists between a sublabral foramen and joint instability.

CONCLUSION

The current study was the first to investigate the relationship between the presence of a sublabral foramen and age, sex and side in a British population. A sublabral foramen was observed in 28.6%

of specimens and was more commonly observed in older individuals (> 70 years old): no statistical differences between the presence of a sublabral foramen and age, sex and side were observed. The association between a sublabral foramen and glenoid notch type or glenohumeral joint instability is still unknown; further study is recommended.

ACKNOWLEDGEMENTS

The authors express their thanks to the donors, and their families: without them this study would not have been possible. Special thanks to both the Centre for Anatomy and Human Identification, University of Dundee and Centre of Anatomy, University of Zawia.

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