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Various types of suprameatal spines and depressions in the human temporal bone

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Abstract Since it covers the lateral wall of the mastoid air system, the suprameatal triangle is of importance to otologic surgeons during mastoidectomy. Because of this clinical importance, topographic anatomy of the suprameatal spine and depression was studied on Anatolian skulls. In all, 363 male and 231 female skulls were studied. The most prevalent type of suprameatal spine resembled a crest and was found in both sexes on the right (77.6%) and left (80%) sides. The absence of a suprameatal depression was significantly higher in females (right 9.1%; left 8.7%) than in males (right 1.7%; left 2.5%). Suprameatal depressions were mostly shallow in female subjects, but were mostly observed in males to be at a medium depth or deep.

Key words Temporal bone anatomy · Suprameatal spine · Suprameatal depression

Introduction

The suprameatal triangle (or "Macewen's triangle") is a depression that marks the lateral wall of the mastoid antrum and is located just between the anterior end of the supramastoid crest and the posterosuperior quadrant of the external acoustic meatus [3]. It has been studied as an epigenetic variation by McWilliams [8] but not reported by Berry and Berry [4]. Since the mastoid antrum lies about 12–15 mm below, it is generally accepted as a useful anatomic landmark for surgical access to the antrum [1, 6, 9, 11, 14]. This suprameatal depression can certain a bony spicule or crest in its anterior margin. This suprameatal spine ("spine of Henle") not uncommonly varies in shape, size and position. In classical textbooks of anatomy, this spine has been described as serving as an additional attachment point for the ligaments fixing the cartilaginous parts of the external acoustic meatus [13] and temporal fascia and muscle [14]. Because of their anatomical locations both the suprameatal triangle and spine are of clinical importance to otologic surgeons [6].

The postauricular incision described in 1853 by Wilde is still a widely used surgical approach to the temporal bone [12]. The temporal line is the superior landmark for this postauricular incision. However, clear determination of the suprameatal triangle is clinically important for the localization of the mastoid antrum and tegmen tympani, since it is a significant topographic landmark separating the middle cranial fossa and mastoid antrum [11].

The aim of the present study was to show the morphological pecularities of the suprameatal triangle and spine in Anatolian skulls and the relationship between these two structures according to size and shape.

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Materials and methods

The existence and shape of the suprameatal spine and depth of the suprameatal triangle were studied in 363 male and 231 female skulls and classified according to McWilliams [8] classification. In this latter study spines were grouped according to their dimensions as "small" (< 2 mm) and "large" (> 2 mm). In our study spines were classified as "small" (< 1.5 mm), "medium" (1.5–2.5 mm) and "large" (> 2.5 mm). Data were evaluated according to the existence, size, depth and shape of the suprameatal spine and depression. Gender and side differences were also evaluated.

All skulls were obtained from the collection of the Department of Paleoanthropology in Ankara University, Faculty of Letters.

Chi square and kappa tests were used for statistical significance.

Results

No overt congenital anomalies were observed in any of the 594 Anatolian skulls studied, allowing the sizes and shapes of the suprameatal spines and depths of the triangles on both sides of the "normal" bone to be analyzed (Table 1). When the suprameatal spines were evaluated according to their types, the occurrence of the "crest type" was significantly greater than the "triangular type" in both sexes. In contrast, as depicted in Table 2, the occurrence of the triangular type was higher in both sides in males than in females ($P < 0.001$).

Dimensions of the suprameatal spines were also evaluated (Table 3). In male bones the incidence of the "medium" and "large" types was higher than in females ($P < 0.001$).

Table 1 Shapes and dimensions of the suprameatal spine and depths of the suprameatal depression on both sides

		Right	Left	Right (%)	Left (%)
Types of suprameatal spines	Absence	38	25	6.4	4.2
	Crest	461	473	77.6	80
	Triangular	95	93	16.0	15.7
	Total	594	591	100.0	100.0
Dimensions of suprameatal spines	Absence	39	26	6.6	4.4
	Small	237	242	39.9	40.9
	Medium	186	194	31.3	32.8
	Large	132	129	22.2	21.8
	Total	594	591	100.0	100.0
Depth of suprameatal depressions	Absence	27	29	4.5	4.9
	Shallow	193	185	32.5	31.3
	Medium	188	210	31.6	35.5
	Deep	186	167	31.4	28.3
	Total	594	591	100.0	100.0

When the skulls were evaluated according to suprameatal spine types and dimensions (Table 4), a significant correlation was observed between the two sides ($P < 0.001$; K 0.54).

In addition, the suprameatal depression was mostly deeper when it was found in association with a triangular type of suprameatal spine (Table 5). There was also a significant correlation between the two sides according to the depth of the suprameatal depression ($P < 0.001$; K 0.62; Table 6). Absence of a suprameatal depression was significantly higher in female bones than in males. Similarly, the incidence of shallow depressions was greater in female bones than in males (Table 7). Both in male and female the bone dimensions of the suprameatal spine were found to increase as the depth of suprameatal depression increased (Figs. 1–9).

Discussion

Suprameatal triangle and spine begin to develop at the end of first year, but traces may be observed at birth [9, 10]. This contrasts with Clarke's [5] 1893 study, which noted that development of the suprameatal spine did not occur until the age of 5. Since the suprameatal triangle and the spine at its lower border nearly complete their development in early adolescence, no changes in these structures have been reported in adult temporal bones [2].

When the suprameatal triangle is formed early in fetal life, it localizes quite distant from the tympanic ring [2, 10]. As the suprameatal spine represents its lower border, it would probably be large in size when the suprameatal triangle begins to develop early in fetal life [9]. Thus, a large suprameatal spine and deep suprameatal triangle can be accepted as a sign of early embryological development.

A higher occurrence of the suprameatal triangle has been observed in males than females in various studies [1, 7, 8]. In our present study the occurrence of both a suprameatal triangle and spine was observed to be signif-

Table 2 Types of suprameatal spine on both sides in males and females

	Right			Left		
	Male	Female	Total	Male	Female	Total
Absence	12 (3.3%)	26 (11.3%)	38 (6.4%)	9 (2.5%)	16 (6.9%)	25 (4.2%)
Crest	287 (79.1%)	174 (75.3%)	461 (77.6%)	285 (79.2%)	188 (81.4%)	473 (80.0%)
Triangular	64 (17.6%)	31 (13.4%)	95 (16.0%)	66 (18.3%)	27 (11.7%)	93 (15.7%)
Total	363 (61.1%)	231 (38.9%)	594 (100%)	360 (60.9%)	231 (39.1%)	591 (100%)

Table 3 Dimensions of suprameatal spine on both sides in males and females

	Right			Left		
	Male	Female	Total	Male	Female	Total
Absence	12 (3.3%)	27 (11.7%)	39 (6.6%)	10 (2.8%)	16 (6.9%)	26 (4.4%)
Small	129 (35.5)	108 (46.8%)	237 (39.9%)	124 (34.4%)	118 (51.5%)	242 (40.9%)
Medium	118 (32.5)	68 (29.4%)	186 (31.3%)	126 (35.0%)	68 (29.4%)	194 (32.8%)
Large	104 (28.7%)	28 (12.1%)	132 (22.2%)	100 (27.8%)	29 (12.6%)	129 (21.8%)
Total	363 (61.1%)	231 (38.9%)	594 (100%)	360 (60.9%)	231 (39.1%)	591 (100%)

Table 4 The relationship between the shapes and dimensions of the suprameatal spine on both sides

		Dimensions of suprameatal spines (left)				
		Absence	Small	Medium	Large	Total
Dimensions of suprameatal spines (right)	Absence	18 (69.2%)	19 (8.0%)	1 (0.5%)	–	38 (6.5%)
	Small	6 (24%)	179 (75.5%)	41 (21.4%)	4 (3.1%)	230 (39.6%)
	Medium	1 (4.0%)	31 (13.1%)	114 (59.4%)	36 (28.3%)	182 (31.3%)
	Large	–	8 (3.4%)	36 (18.8%)	87 (68.5%)	131 (22.5%)
	Total	25 (4.3%)	237 (40.8%)	192 (33%)	127 (21.9%)	581 (100%)

		Types of suprametal spines (left)			
		Absence	Crest	Triangular	Total
Types of suprameatal spines (right)	Absence	18 (72%)	19 (4.1%)	–	37 (6.3%)
	Crest	7 (28%)	415 (89.1%)	31 (33.7%)	453 (77.7%)
	Triangular	–	32 (6.9%)	61 (66.3%)	93 (16%)
	Total	25 (4.3%)	466 (79.9%)	92 (15.8%)	583 (100%)

Table 5 Relations between the depth of suprameatal depression and types of suprameatal spine

		Types of suprameatal spines (right)			
		Absence	Crest	Triangular	Total
Depths of the suprameatal depression (right)	Absence	15 (39.5%)	11 (2.4%)	1 (1.1%)	27 (4.5%)
	Shallow	21 (55.3%)	156 (33.8%)	16 (16.8%)	193 (32.5%)
	Medium	2 (5.3%)	154 (33.4%)	32 (33.7%)	188 (31.6%)
	Deep	–	140 (30.4%)	45 (48.4%)	186 (31.3%)
	Total	38 (6.4%)	461 (77.6%)	95 (16%)	594 (100%)
		Types of suprametal spina (left)			
Depths of the suprameatal depression (left)	Absence	13 (44.8%)	16 (55.2%)	–	29 (4.9%)
	Shallow	11 (5.9%)	161 (87%)	13 (7%)	185 (31.3%)
	Medium	–	173 (82.4%)	37 (17.6%)	210 (35.5%)
	Deep	1 (0.6%)	123 (73.7%)	43 (25.7%)	167 (28.3%)
	Total	25 (4.2%)	473 (80%)	93 (15.7%)	591 (100%)

Table 6 Correlation between the two sides according to the depth of the suprameatal depression

		Depth of the suprameatal depression (left)				
		Absence	Shallow	Medium	Deep	Total
Depth of the suprameatal depression (right)	Absence	19 (65.5%)	7 (3.9%)	1 (0.5%)	–	27 (4.6%)
	Shallow	6 (20.7%)	145 (80.1%)	33 (15.7%)	4 (2.5%)	188 (32.2%)
	Medium	4 (13.8%)	24 (13.3%)	131 (62.4%)	26 (16.0%)	185 (31.7%)
	Deep	–	5 (2.8%)	45 (21.4%)	133 (81.6%)	183 (31.4%)
	Total	29 (5.0%)	181 (31.0%)	210 (36.0%)	163 (28%)	583 (100%)

Table 7 Depth of the suprameatal depression on both sides in males and females

	Right			Left		
	Male	Female	Total	Male	Female	Total
Absence	6 (1.7%)	21 (9.1%)	27 (4.5%)	9 (2.5%)	20 (8.7%)	29 (4.9%)
Shallow	103 (28.4%)	90 (39.0%)	193 (32.5%)	93 (25.8%)	92 (39.8%)	185 (31.3%)
Medium	123 (33.9%)	65 (28.1%)	188 (31.6%)	139 (38.6%)	71 (30.7%)	210 (35.5%)
Deep	131 (36.1%)	55 (23.8%)	186 (31.3%)	119 (33.1%)	48 (20.8%)	167 (28.3%)
Total	363 (61.1%)	231 (38.9%)	594 (100%)	360 (60.9%)	231 (39.1%)	591 (100%)

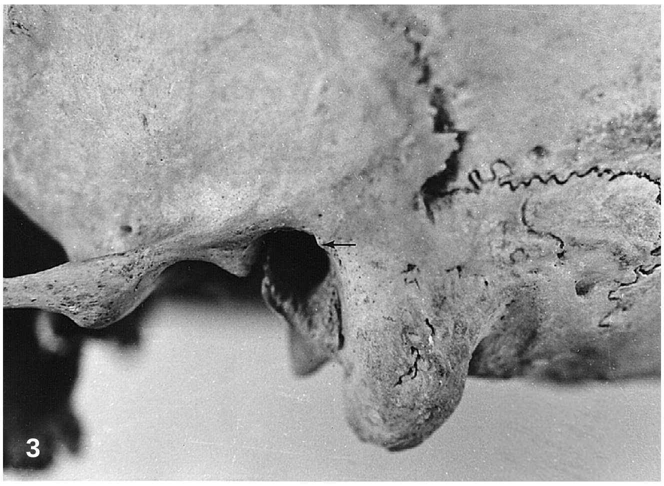

Fig. 1 Absence of the suprameatal spine and suprameatal depression

Fig. 2 Absence of the suprameatal spine and presence of a deep suprameatal depression (➔)

Fig. 3 Small triangular type of suprameatal spine (→) and no suprameatal depression

Fig. 4 Middle triangular type of suprameatal spine (→) and small suprameatal depression (➔)

Fig. 5 Large triangular type of suprameatal spine (→) and small suprameatal depression (➔)

icantly higher in males. In most previous studies the suprameatal spine was mostly observed as a crest type [1, 7, 8]. Also, in this study most of the spines were crest-like.

A bilateral suprameatal spine has been mostly observed by various authors. We also found that the suprameatal spine and depression were observed bilaterally in most of our skulls. Pensa [10] and Hauser and De Stefano [7] have pointed out that both types of suprameatal spine can occur independent of any depression. Nonetheless, we found a high correlation between the depth of the suprameatal triangle and the shape of suprameatal spine.

In chronic bone disease the bony cortex in the region of the suprameatal triangle can be deceptively thick, while in such diseases as acute mastoiditis, the bony cortex can be

Fig. 6 Large triangular type of suprameatal spine (→) and deep suprameatal depression (➜)

Fig. 7 Middle crest type of suprameatal spine (→) and small suprameatal depression (➜)

Fig. 8 Large crest type of suprameatal spine (→) and deep suprameatal depression (➜)

Fig. 9 Large crest type of suprameatal spine (→) and middle type of suprameatal depression (➜)

lost secondary to disease [6]. Still, the depth of suprameatal triangle and the types of suprameatal spine can be important for surgical approaches in this region.

References

1. Akabori E (1933) Crania nipponica recentia. Analytical inquiries into the non-metric variations in the Japanese skull. Jpn J Med Sci I Anat 4:61–318
2. Anson BJ, Bast TH, Richany SF (1955) The fetal and early postnatal development of the tympanic ring and related structures in man. Ann Otol 64:802–823
3. Berkovitz BKB, Moxham BJ (1988) A textbook of head and neck anatomy. Wolfe Medical, London
4. Berry AC, Berry RJ (1967) Epigenetic variation in the human cranium. J Anat 101:361–379
5. Clarke JJ (1893) Some observation on the temporal bone, chiefly in childhood. J Anat Physiol 27:411–414
6. Cummings CW, Fredrickson JM, Harker LA, Krause CJ, Schuller DE (1993) Otolaryngology head and neck surgery, 2nd edn. Mosby Yearbook, St Louis
7. Hauser G, De Stefano GF (1989) Epigenetic variants of the human skull. E. Schweizerbartsche Verlagsbuchhandlung (Nägele und Obermiller), Stuttgart
8. McWilliams KR (1974) Gran Quiviera Pueblo and biological distance in the U.S. Southwest. PhD thesis, University of Arizona, Tucson (Univ. Microfilm, 74–20, 142)
9. Paparella MM, Shumrick DA (1980) Otolaryngology, vol 1. Basic sciences and related disciplines, 2nd edn. Saunders, Philadelphia
10. Pensa A (1907) Osservazioni sulla “spina suprameatum”. Boll Soc Med Chir Pavia 21:272–284
11. Romanes GJ (1992) Cunningham’s manual of practical anatomy, vol III. Head and neck and brain. Oxford University Press, London
12. Stevenson RS, Guthrie D (1949) A history of oto-laryngology. Livingstone, Edinburgh
13. Tandler J (1926) Lehrbuch der systematischen Anatomie, vol 1, 2nd edn. Vogel, Leipzig
14. Williams PL, Warwick R, Dyson M, Bannister LH (1993) Gray’s anatomy, 37th edn. ELBS with Churchill Livingstone, Edinburgh