

Anatomical landmarks for the localization of the greater palatine foramen in Polish skulls

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INTRODUCTION

Dental procedures involving the hard and soft palates require anesthesia administration to the maxillary division of the trigeminal nerve. This nerve passes through the greater palatine foramen (GPF), thus, it is essential that the foramen be properly identified.

OBJECTIVE

The aim of the present study was to provide multiple anatomical landmarks to aid in the localization of the GPF.

METHODS

Computer tomography (CT) scans of 199 skulls (87 male and 112 female) of patients residing in Cracow, Poland were analyzed using the eFilm Workstation program. Measurements of the distance between the GPF and the incisular (INC), the spina nasalis posterior (SNP), the intermaxillary suture (IMS), as well as the second (M2) and third (M3) molars were made.

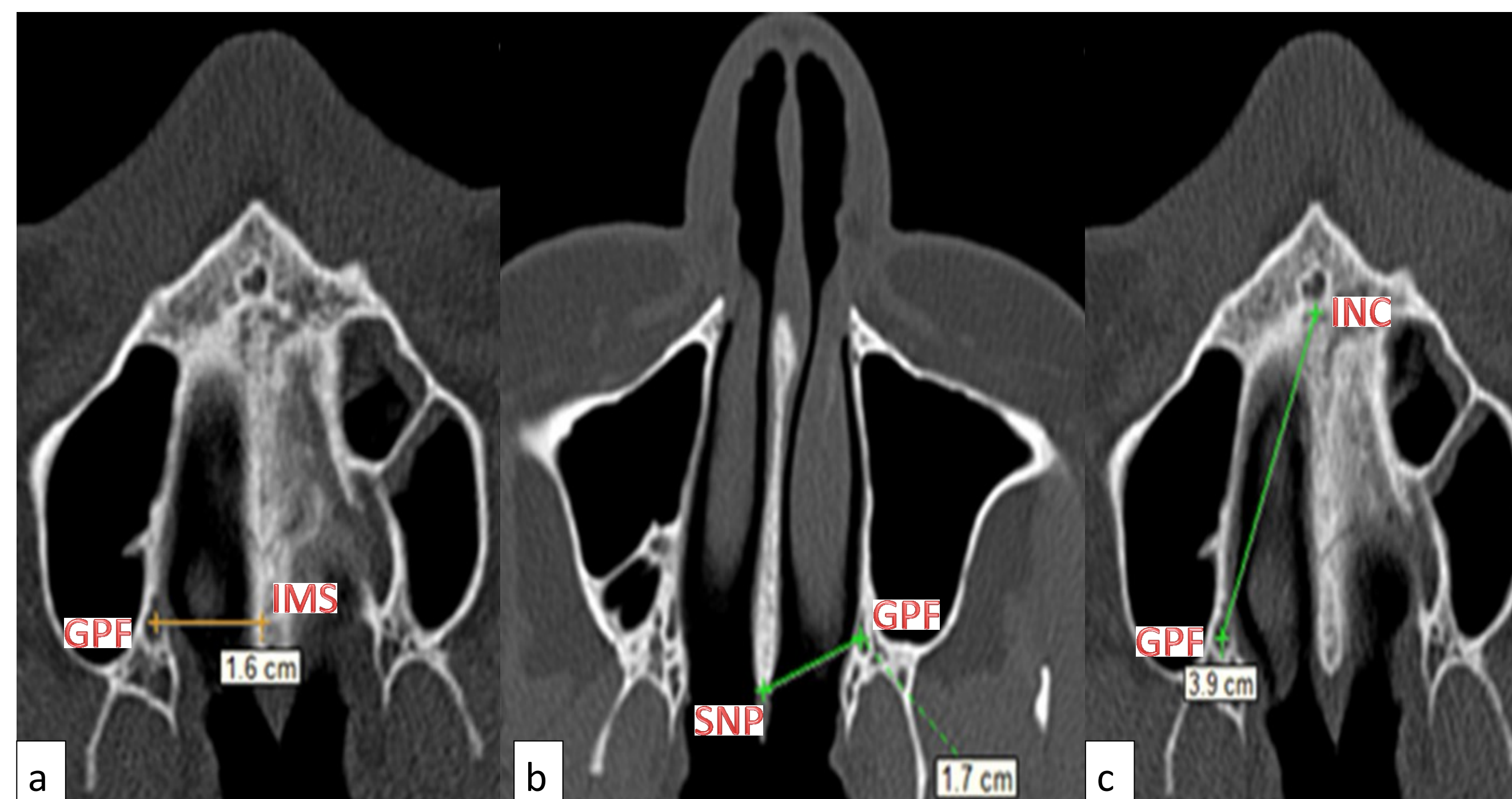


Figure 1- Measurement of the distances between the GPF and the IMS (a), SNP (b), and INC (c). INC is the point at which the incisive foramen meets the IMS.

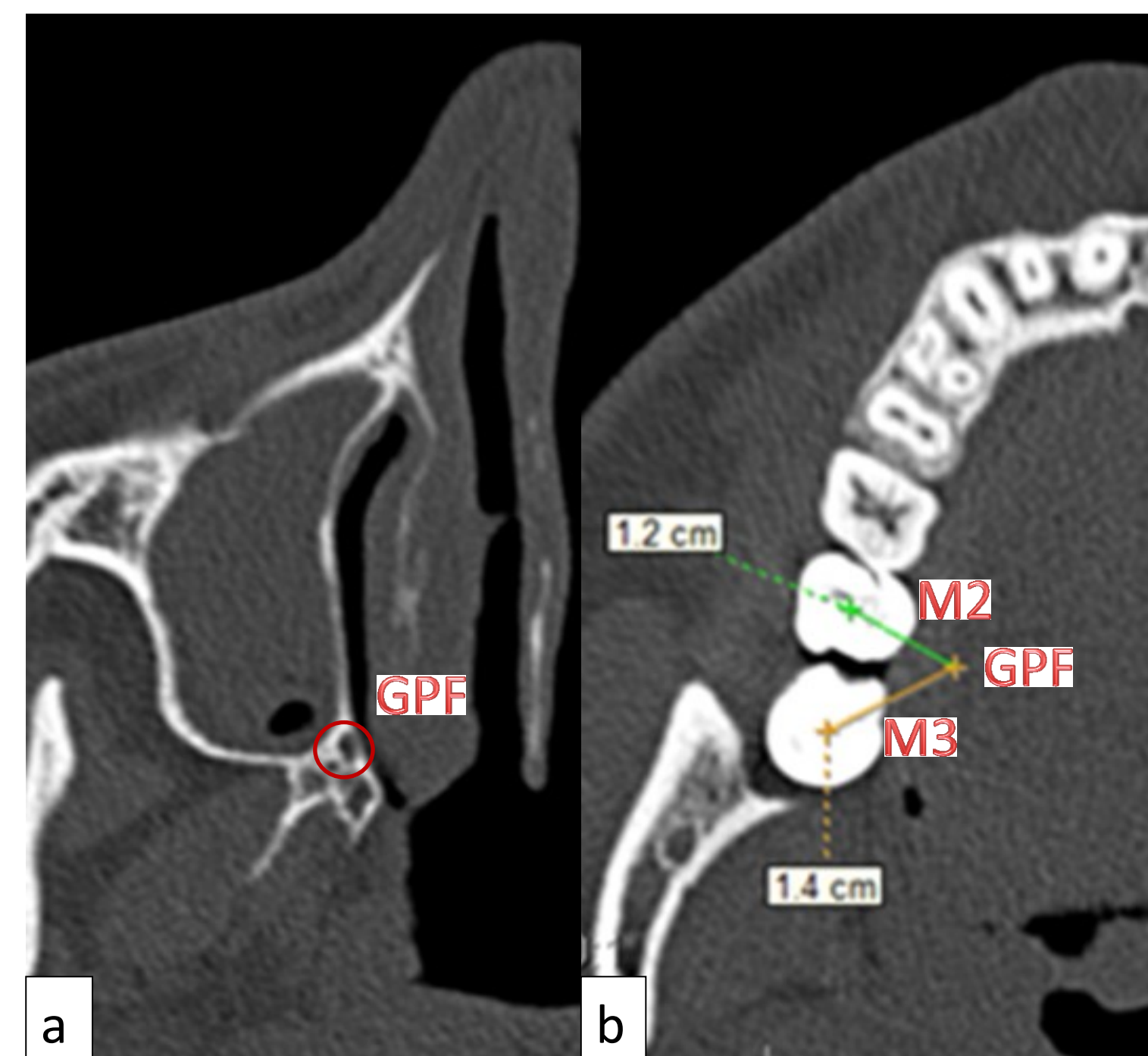


Figure 2 – Measurement of the distance between the center of the GPF and the center of both molars (M2 and M3). The GPF(a) was not localized in the same slice of the CT scans as the molars(b) so its location was marked at the level of M2 and M3 to allow the distances to be measured.

RESULTS

On average the left GPF was located 16.87 ± 0.10 mm away from the SNP, 35.05 ± 0.25 mm away from the INC, and 15.50 ± 0.11 mm away from the intermaxillary suture. On the right, the average GPF location was 16.86 ± 0.10 mm away from the SNP, 34.83 ± 0.25 mm away from the INC, and 16.10 ± 0.11 mm from the intermaxillary suture. Of the skulls analyzed, 73.87% had at least one M2 averaging a distance of 11.75 ± 0.19 mm from the GPF on the left and 11.60 ± 0.20 mm on the right. Meanwhile, 40.2% had at least one M3 with an average distance of 11.75 ± 0.28 mm from the GPF on the left and 11.25 ± 0.27 mm on the right. Bilaterally, the proximity of the GPF to the molar teeth differed significantly, $X^2(2, n=77)=17.56, p<0.001$ and $X^2(2, n=75)=18.96, p<0.001$ on the left and right respectively. In the majority of skulls, the GPF was located closer to M3 (52.3% on the left and 50.7% on the right). The second most common location was closer to M2 (32.5% on the left and 38.7% on the right) followed by a much smaller proportion located equidistantly between the two molars (14.3% on the left and 10.7% on the right). Bilaterally, male skulls had greater GPF-SNP ($p<0.001$), GPF-INC ($p<0.001$), and GPF-intermaxillary suture ($p=0.001$; $p=0.002$ right and left respectively) distances than female skulls.

Table 1 - Distance of the greater palatine foramen from the INC, SNP and IMS in males and females.

	GPF-IMS (L)	GPF-IMS (R)	GPF - SNP (L)	GPF - SNP (R)	GPF - INC (L)	GPF - INC (R)
<i>Female</i>						
Mean	15.2	15.8	16.5	16.4	34.1	34.0
SEM	.137	.129	.130	.114	.299	.269
Median	15.0	16.0	17.0	16.0	34.0	34.0
Mode	14.0	16.0	17.0	16.0	33.0	34.0
SD	1.46	1.37	1.38	1.21	3.17	2.86
Min	12.0	13.0	13.0	13.0	27.0	28.0
Max	19.0	20.0	20.0	20.0	42.0	41.0
<i>Male</i>						
Mean	15.9	16.5	17.4	17.4	36.4	36.0
SEM	.162	.165	.148	.154	.391	.412
Median	16.0	17.0	17.0	17.0	36.0	36.0
Mode	17.0	17.0	17.0	17.0	35.0	36.0
SD	1.51	1.54	1.37	1.43	3.58	3.80
Min	12.0	13.0	13.0	14.0	28.0	28.0
Max	20.0	20.0	20.0	20.0	44.0	46.0

Abbreviations: SEM = Standard error of the mean; SD = standard deviation; Min = minimum; Max = maximum; (R)= right; (L)=left.

CONCLUSIONS

The utilization of multiple anatomical reference points, such as the incisular, the intermaxillary suture, and the second and third molars would be useful during dental procedures to ensure proper administration of anesthesia through the GPF.

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