

Coronoid Foramina of Mandible: A recent discovery in humans

Clinical series of 48 patients including a paediatric variant

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Observational clinical study

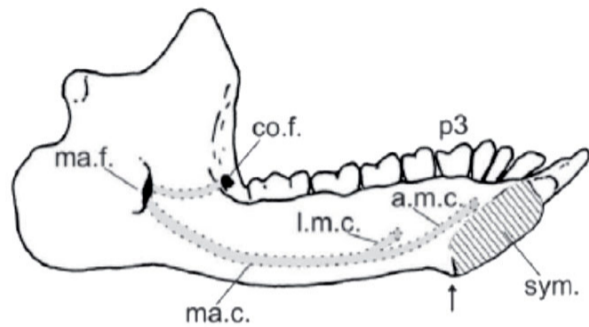
The aim of this clinical series is to determine the prevalence of coronoid foramen using panoramic radiographs and CBCT while evaluating its variability in terms of unilateral, bilateral or gender predilection and propose the significance of this recently discovered anatomic variation

1. Background

- The etymology of coronoid comes from the Greek word korax for raven or crow; it also comes from the Greek word korone for hooked. A foramen on this prominent bony structure of the oro-facial region was recently discovered⁴.
- The coronoid foramen was seen to exist in paenungulates, including early genera such as: Seggeurius, Eriththerium, Phosphatherium, Arsinotherium and Prorastomus and was recovered as a paenungulate Synapomorphy³ suggesting its phylogenetic hypothesis.
- The incidence of a coronoid foramen in a live human subject is rare and hence the scarcity of the literature.
- The author in this poster aims to present the unique discovery of 'Coronoid foramina' in a clinical series of 48 patients including a paediatric variant which has never been seen or documented in literature so far.

Keywords:

Mandible, Coronoid, Foramina, Bilateral variant, Unilateral variant, Accessory coronoid variant, Pediatric Variant.



Schematic representation of mandible of basal proboscidean³, depicting the principal anatomy of coronoid and mandibular canals and their associated foramina. Lingual view: the courses of the mandibular and coronoid canals are reconstructed based on the position of the external foramina. a.m.c., anterior mental canal; co.f., coronoid foramen; l.m.c., lateral mental canal; ma.c., mandibular canal; ma.f., mandibular foramen; sym., symphysis. Arrow indicates the position of the posterior border of the symphysis

2. Embryology

- A critical period occurs in the development of the primate cerebrum between the 3rd & 4th months of foetal life. About this time, the cerebrum takes that step which lifts it beyond the quadruped stage and places it upon the higher primate platform. Previous to this change, the cerebrum presents a form similar to that of a quadruped; but now the occipital lobe takes shape, and the cerebrum assumes a form and an outline which are characteristic of man and the apes and of them alone¹.
- A variation may occur in man which produces a structural character identical with what is seen normally in another animal group. This variation may be truly atavistic, but for all that it does not follow, as a matter of course, that it is genetically related to the corresponding character in the animal group. This possibility should always be borne in mind in determining the proper value of an anatomical variation².

3. Materials & Methods

- 987 OPGs were scrutinised for presence of coronoid foramina and confirmed using 3D CBCT scans from Aug 2017 till date.
- Descriptive and inferential analyses were done; significance is assessed at a 5% level (Table 1). Chi-Square or Fisher Exact Test was used to find the significance of study parameters on categorical scale between two or more groups and a non-parametric setting for qualitative data analysis (Graph 1). Fisher Exact Test was used when cell samples were small & Statistical Software SPSS 2.0 and R environment 3.2.2 were used for statistical analysis purposes.

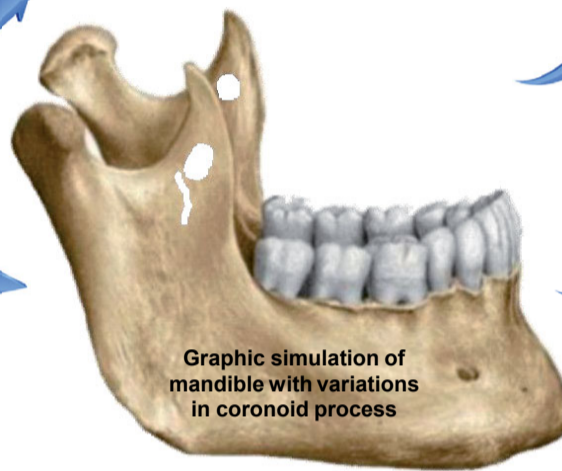
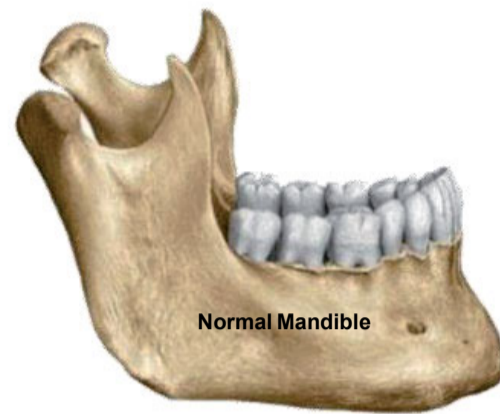
Table 1. Variant type and its association with Gender

Variant type	Gender		Total		
	Female	Male		Females	Males
No variations	699	288	987	54%	46%
Variations	26	22	48	3.86%	7.6%
Bilateral foramina with accessory Coronoid foramen	3	0	3		
Bilateral Foramen	11	18	29		
Unilateral left sided	4	3	7		
Unilateral Right sided	8	1	9		

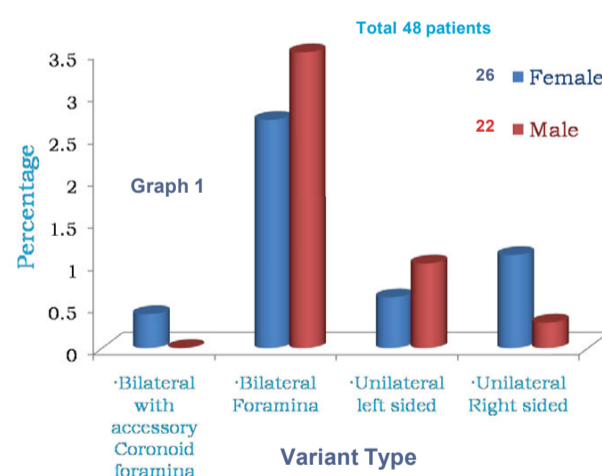
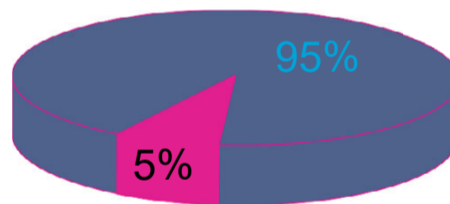
4. Discussion

- Accessory mandibular foramina are constant structures of human mandible, more prevalent in posterior region than anterior.
- Majority of times bilaterally symmetrical (Fig 1) but variants (Fig 3, Fig 4) are known to exist in size shape and number⁵.
- Nerves, neuro-vascular bundles, arterioles have been found to occupy these accessory canals and foramina² (Fig 2).
- The awareness of such foramina is clinically important as they can lead to diagnostic and therapeutic misinterpretations

It is not always immediately imperative that everyone shares a similar view of clinical significance about the rare findings in anatomic science that are interesting and yet important.



Variations: 5%



5. Significance of variations

- The anatomical variations are errors in the embryologic developmental timing or persistence of normally obliterated structures. Of the variations in structure, a very large number can be placed in one of the two categories: retrospective and prospective types.
- Retrospective anatomic variations act as sign posts, planted at very irregular intervals, and often appearing in unexpected places, which indicate the path which the individual has traversed in his ontogenetic and phylogenetic development.
- The prospective type yields evidence, often most uncertain, almost always vague and faltering, which gives some inkling of the direction towards which the phylogenetic evolution is tending¹.



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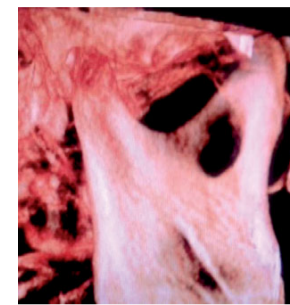


Fig 1. CBCT 3D reconstruction of large coronoid foramen with lateral accessory mandibular canal

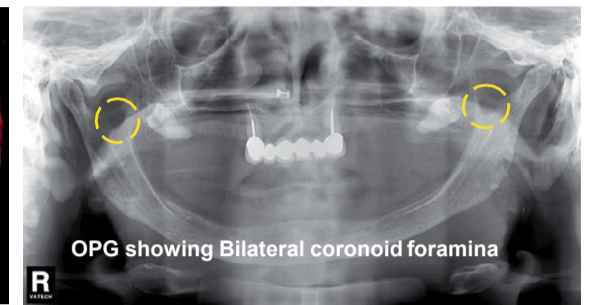


Fig 2. Steriolithographic 3D printed model of a patient depicting the various accessory foramina in his skull with simulation of nerves and emissary veins based on MRI findings.

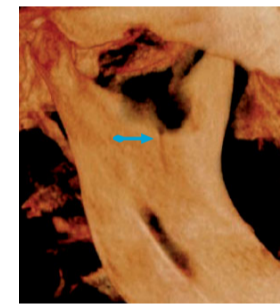
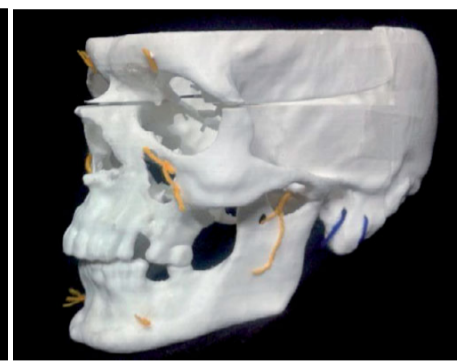


Fig 3. Accessory coronoid foramen & canal with lateral mandibular canal

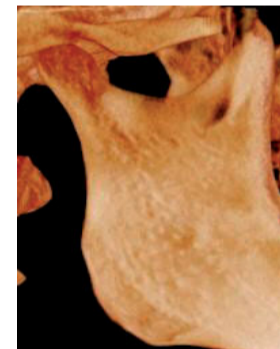
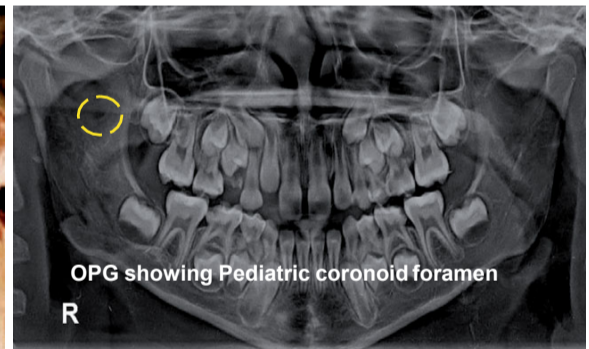


Fig 4. 3D CBCT scan showing right sided Coronoid Foramen



6. Surgical Implications

- Lack of profound anesthesia after routine administration of local anesthetic agents can be attributed to various factors, which may include, but are not limited to, faulty technique, inadequate anesthetic solution, local inflammatory state or presence of morphological variations.
- These anatomical variant combinations have never been reported previously, Patients with these variations require cautious pre-surgical planning since they are at much greater risk of injury to the neurovascular bundle, affecting blood supply to the head and neck region and of iatrogenic complications if invasive procedures are undertaken without the knowledge of such variations beforehand.

7. Conclusion

- Every surgeon needs to have a dogmatic approach with understanding of anatomical variations as they may potentially prevent a clinician from achieving successful treatment outcomes.
- Pertinent diagnostic and pre-surgical assessment of the region will not only help to assess any anatomical variants present, but also influences the outcome of surgical procedures related to that particular region along with preventing any sort of iatrogenic injuries to these variant structures post operatively.
- It is undeniable that diagnostic to prognostic evaluation of such patients needs to be studied further for better understanding of the outcome.

8. References

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