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An anatomico-radiological study of an accessory mandibular foramen on the medial mandibular surface

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Unnamed foramina are known to be present in the mandible. The present research paper reports the presence of an accessory foramen on the medial surface of the mandible, highlighting its anatomico-radiological details. Accessory foramina in the mandible have been known to transmit branches of nerves supplying the roots of the teeth. Nerve block techniques by local anaesthetics might fail if any of these nerves or their branches pass through these accessory foramina and thus escape the nerve block. Dental surgeons performing extractions should be aware of accessory foramina on the mandible and thus plan anaesthesia at an appropriate anatomical site. The presence of such foramina might also be an alternate route for tumour spread following radiation therapy. Precise knowledge and awareness of such accessory mandibular foramina would therefore be important for dental surgeons performing nerve block and also for oncologists in planning radiation therapy.

Key words: accessory foramen, mandible, double mandibular canal

INTRODUCTION

The mandibular foramen (MF) is irregular and located just above the centre of the mandible on the medial surface [4]. Traced below, MF leads into the mandibular canal, which continues downwards below the alveoli towards the body of the mandible [4]. The inferior alveolar nerve and vessels continue into the mandibular canal after entering the mandibular foramen. The branches of the alveolar nerves and vessels then enter the roots of the teeth and the periodontal septa [4].

The incidence of accessory mandibular foramina (AMF) has been found to be greater on the medial surface than on the lateral surface [3, 6]. These accessory foramina are known to transmit the branches of facial, mylohyoid, buccal and transverse cervical cutaneous nerves [4]. During routine dental extractions nerve block by local anaesthetic might fail if the branches of the inferior alveolar nerves pass through these accessory foramina and thus escape anaesthesia. An accessory mandibular foramen is known to provide an easy route for the spread of tumour cells following radiotherapy [1, 9, 10, 16]. Knowledge of the anatomical details of AMF may then be of significant clinical interest to surgeons and oncologists in clinical practice.

CASE REPORT

During routine scanning of bones in the osteology section of the Department of Anatomy we detected an AMF on the medial surface of the right half of the mandible. The accessory mandibular foramen was located 0.4 cm vertically above the lingula on the medial surface. A linear groove measuring 0.4 cm in length was observed vertically above AMF.

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A skiagram of the mandible was obtained after guiding a wire probe through the usual MF and AMF to study their inter-relationship. Both the bone and the skiagram were photographed (Fig. 1, 2).

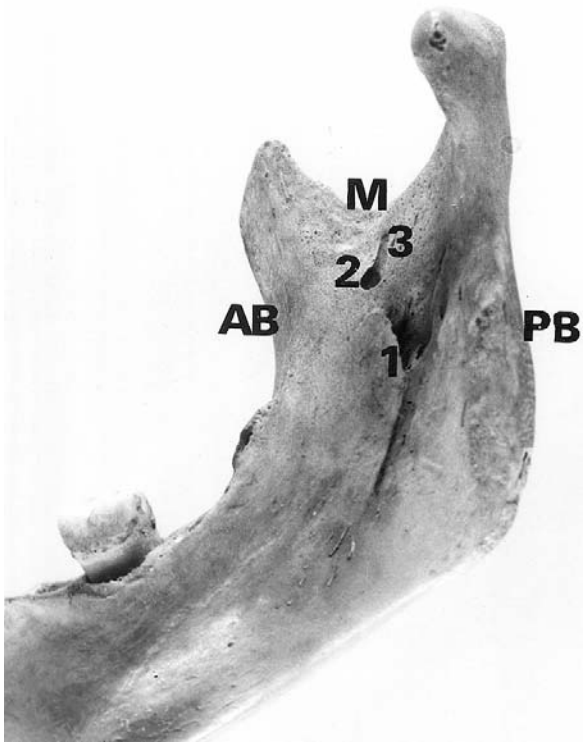

Figure 1. Photograph of the medial surface of the right half of the mandible showing: 1 — the mandibular foramen (MF), 2 — an accessory mandibular foramen (AMF), 3 — a linear groove above the AMF, AB — the anterior border, PB — the posterior border, M — the mandibular notch.

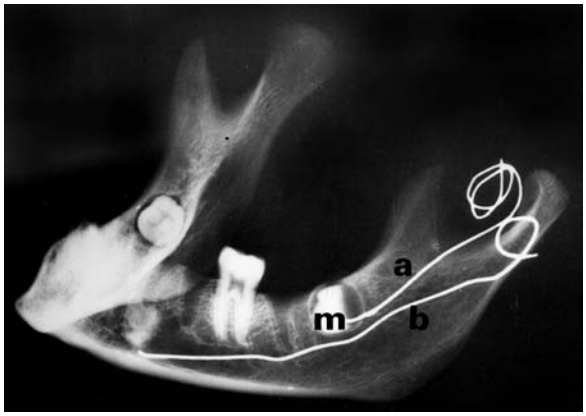

Figure 2. Skiagram showing a wire-guided probe through the MF and the AMF; a — the probe through the AMF leading into the root of the 3rd molar tooth, b — the probe through the usual MF, m — the root of the 3rd molar tooth.

On the right side

The vertical distance of AMF from the masseteric notch was 0.9 cm. The distance of AMF from the anterior and posterior borders of the mandible was 1.5 cm in each case. The distance of the usual MF from the anterior and posterior borders of the ramus of the mandible was 1.8 cm and 1.4 cm respectively. The distance of MF to the angle of the mandible was 2.3 cm.

A radiological study of the mandible (Fig. 2) revealed that AMF led into a canal that terminated close to the root of the 3rd molar. This canal did not communicate with the usual mandibular canal.

On the left side

There was no AMF. The distance of MF from the anterior and posterior borders of the ramus of the mandible was 1.8 cm and 1.4 cm respectively. The distance of MF to the angle of the mandible was 2.3 cm.

It was found that AMF was equidistant from the anterior and posterior borders of the mandible. The mandibular foramen was found to be nearer to the posterior border of the ramus on both sides.

DISCUSSION

Earlier studies have reported the fact that more foramina are found on the medial surface of the mandible than the lateral surface [3, 6]. The presence of an AMF in the mandible might indicate that extra blood vessels traverse it to supply the bone [7]. Accessory mandibular foramina are also known to transmit branches of the inferior alveolar nerve. The passage of blood vessels and branches of nerves makes the presence of AMF clinically important. A previous research study has reported that in 60% of cases the mandibular canal was found to have the entire inferior alveolar nerve passing through it, while in 40% cases the nerves were scattered [13]. This important research finding of the spread of the inferior alveolar nerve raises the question of the possible presence of another nerve passing through the mandibular canal, usually the nerve to the mylohyoid [7]. The wire-guided X-ray picture (Fig. 2) showed that the canal leading from AMF terminated close to the root of the 3rd molar. This implies the possibility that any nerve passing through AMF might be supplying the 3rd molar, as seen in this case. This kind of alternative route of passage of any nerve supplying the 3rd molar might be responsible for the

failure of dental nerve block. Awareness of the presence of AMF may be important in achieving successful inferior alveolar nerve anaesthesia and so this is best performed at a higher level using the technique also known as the Gow-Gates technique [11]. This procedure involves the administration of the anaesthetic solution at a higher level before the division of the mandibular nerve [15].

The developmental reason for the presence of AMF might lie in the fact that the 3 inferior alveolar nerves develop initially to innervate each of the 3 groups of mandibular teeth [2]. In the later period, there is fusion of the nerves. Incomplete fusion of these 3 nerves might explain the presence of double mandibular canals [2]. Past research studies have reported the incidence of bifid mandibular canals as ranging between 0.08% and 0.9% [5, 8, 12].

The presence of two mandibular foramina leading to separate mandibular canals on the medial surface of the mandible could have resulted during mesenchymal condensation around the inferior alveolar nerves and vessels. Presumably these two bony canals may have provided two separate channels, one for the inferior alveolar nerve and the other for vessels.

Following radiotherapy an AMF provides an easy route for the spread of a tumour from the cortical to the cancellous part of the bone [3]. Accessory mandibular foramina might also provide an easy route for the spread of infection. It has been found in past studies that the presence of AMF on the medial surface makes it more vulnerable to perineural spread following radiotherapy [3]. The presence of AMF may thus be important for oncologists in planning radiation therapy.

Surgeons performing conservative rim resection procedures should keep in mind tumour involvement in the region of AMF and plan the operative procedure accordingly. The presence of AMF might be important for orthognathic or reconstructive surgery of the mandible and also during dental implants [14, 16].

In view of the clinical importance of AMF, we as anatomists submit that prior anatomical knowledge of such anomalies may be helpful for dental and maxillo-facial surgeons and oncologists performing irradiation in day to day practice.

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