JUXTAORAL ORGAN OF CHIEVITZ: A POTENTIAL PITFALL IN ORAL CANCER DIAGNOSIS.

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INTRODUCTION

In 1885, a Danish histologist, J.H. Chievitz,1 in conjunction with his studies on salivary gland organogenesis in the embryo, noted certain peculiar epithelial structures embedded in a neurofibrous tissue and thought that they represented rudimentary structures that disappeared after parturition. These were first named organon bucco-temporale2 or organ of Chievitz3 and later as juxtaoral organ of Chievitz by Salzer and Zenker.4 Since his original description, most studies on this structure were documented in the German literature1,2,3 with some reports of its occurrence in the English language journals.4-27 Salzer and Zenker4 noted that these structures persisted in adulthood and that they also occur in a wide variety of species including mammals, birds, fish, amphibians and reptiles.

The aims of this paper are:- 1. to present a brief review on the current knowledge of the origin, anatomy, histological appearance, function and clinical presentation of the juxtaoral organ of Chievitz; 2. to report on two instances of this occurrence in tissues removed from patients with known oral cancers; and 3. to alert dentists, surgeons and pathologists to this unusual but normal structure that may be misinterpreted as neural invasion from a carcinoma, thereby avoiding unnecessary surgery.

REVIEW OF THE LITERATURE

The juxtaoral organ of Chievitz is defined as a normal anatomic structure composed of embryologic intraneural epithelial remnants that occurs as a soft tissue nonpalpable mass in the pterygoid space.

ABSTRACT

The juxtaoral organ of Chievitz is a normal structure consisting of discrete epithelial cell nests closely related to nerve bundles and is located within the soft tissues of the pterygoid space, at the plane of injection for the inferior alveolar nerve block. Recognition of this structure is important to dentists, surgeons and oral pathologists because histologically it may simulate neural invasion by a carcinoma and therefore poses as a potential pitfall in oral cancer diagnosis. In this paper, two examples of this structure encountered in biopsy tissues from patients with oral cancer is presented along with a review on the origin, anatomy, histology, function and clinical findings of this organ. Its differential diagnosis from neural invasion by a carcinoma is briefly discussed.
Origin

The origin of the juxtaoral organ of Chievitz remains obscure. Remnants of the parotid gland and other epithelial inclusions have been cited as possible sources of these epithelial structures. Ramsay,14 in his study of fifty-four human embryos and seven fetuses, demonstrated the presence of the juxtaoral organ of Chievitz through various stages of the developing embryo. His findings indirectly supported the oral epithelial inclusion theory. Embryologically, an invagination from the stomatodeal ectoderm arises in the buccal sulcus and migrates into the vicinity of the buccal nerve, which sends branches into these epithelial clusters.4 The process by which these epithelial structures become enclaved within peripheral nerves is not known but possible explanations put forth by Wysocki21 include passive incorporation of epithelial nests during the development or regeneration of these peripheral nerves.

Anatomy

The juxtaoral organ of Chievitz is typically located in the pterygoid fossa.4,15 It is a fusiform mass of tissue interposed between the temporalis muscle and the buccinator muscle or the pterygomandibular raphe next to the ventral edge of the medial pterygoid muscle with innervations from the long buccal nerve. Grossly, it consists of a longish, flat structure with dimensions ranging from 2 to 4 mm by 1 to 1.5 mm by 0.3 to 0.5 mm.2

Histology

Microscopically, it is a multilobulated epithelial mass made up of cell nests and bundles, not connected with each other.15,23 The larger nests and some smaller ones consist of cells resembling squamous epithelium with distinct cytoplasmic boundaries. These squamoid islands often have a circumferential rim of cuboidal or columnar cells.15 Others may be duct-like with colloidal luminal content. Myelinated nerve endings spiral around these epithelial islands in an intimate manner.

Histochemical studies revealed that the epithelial cell nests are nonmucicarminophilic, but PAS demonstrated a prominent basement membrane around them. Calcification and melanin have been identified within these nests as confirmed by von Kossa stain and bleaching respectively.19

Immunohistochemical studies showed that these epithelial cells were reactive with antibodies against cyto keratins KL-1 and 19 but were nonreactive with antibodies against desmin, chromogranin, neuron-specific enolase and S-100 protein.7,8

Ultrastructural studies showed dense core granules resembling neurosecretory granules.8,4

Function

The precise function of the juxtaoral organ of Chievitz remains speculative. Ramsay,14 in his extensive study of these structures in developing human embryos and fetuses could not demonstrate any associated exocrine or endocrine function with this organ. Zenker et al.3,4 found that these epithelial structures appeared chemically active and suggested that it has neuroendocrine receptor function. Mandl et al.7 believed that these epithelial cells at the ultrastructural level showed features compatible with a mechanoreceptor function.

Clinical features

Only one instance of the juxtaoral organ of Chievitz presenting as a clinically palpable mass has been reported.16 This occurred in a 5-year-old girl who attended the dental clinic for restorations when the mass was noted by her dentist who was preparing to perform a right alveolar nerve block. The mass, measuring approximately 1.5 cm in diameter, was located behind the molars along the ascending ramus of the mandible, was asymptomatic, bony hard, fixed and discoid with no definite margins. There was no associated bony changes.16
Case report

Case 1

In April 1998, a 42-year-old Indian female, diagnosed as having squamous cell carcinoma of the right buccal mucosa, had excision of the carcinoma with right radial free flap reconstruction done. The excised tumour mass along with some buccinator muscle tissue attached, granulation tissue from an unstipulated extraction socket, tissue from the deep retromolar area and submental lymph nodes were removed intraoperatively, and submitted for histopathological examination.

The submitted specimens consisted of the tumour excised in toto, granulation tissue from

Fig. 1 Case 1. Juxtaoral organ of Chievitz occurring as three discrete epithelial cell nests (E) (arrows) embedded in the submucosal fibrofatty tissue. Loose fibrous connective tissue surrounds these epithelial nests. (Haematoxylin & eosin stain. Original magnification x40).

Fig. 2 Case 1. Details of the epithelial cell nests (E) (arrows) as shown in Fig. 1. These cells have a squamoid character and exhibit peripheral polarization. Note small nerves (N) (arrows). (Haematoxylin & eosin stain. Original magnification x200).
the extraction socket, tissue from the deep retromolar area and submental lymph nodes.

Histological examination of the tissue from the tumour area showed a well-differentiated squamous cell carcinoma, with no evidence of tumour involvement of the granulation tissues from the extraction socket or submental lymph nodes. However in the fibrofatty tissues removed from the retromolar region, a few bland-looking epithelial cell nests and nerve bundles are seen (Figs. 1-3). These epithelial cells are squamoid in appearance and showed peripheral polarization (Fig. 2). Cytological features of atypia were absent.

Fig. 3 Case 1. Another part of the submucosal fibrofatty tissue showing squamoid epithelial cell nests (E) (arrows) closely related to scattered nerve bundles (N) (arrows). (Haematoxylin & eosin stain. Original magnification x200).

Fig. 4. Case 2. Low power view showing a single epithelial island (E)(arrow) located in the submucosal fibrofatty tissue. Note normal salivary lobule (S) (asterick) in the adjacent area. (Haematoxylin & eosin stain. Original magnification x10)
Case 2

A 20-year-old Indian female, who had surgical removal of a mucoepidermoid carcinoma in June 1996, attended the dental clinic six weeks later for extraction of her lower left third molar and for surgical removal of suspicious-looking overlying soft tissues. Radiographs showed no evidence of underlying bony involvement.

Eleven pieces of soft tissue were submitted for histopathological evaluation. Microscopically, the specimen consisted of several normal salivary lobules with adjacent striated muscle bundles, parts of oral mucosa and underlying fibrofatty tissues. Deep in this tissue a single epithelial cell nest and a few scattered nerves were observed (Figs. 4 and 5). This epithelial cell nest was cytologically bland-looking.

DISCUSSION

The juxtaoral organ of Chievitz is a structure probably unknown to many dentists, surgeons and oral pathologists. Nonetheless it should be of interest to them because it is located near the plane of injection for the inferior alveolar nerve block. Its importance lies in the fact that it is a potential pitfall in oral cancer diagnosis. This has been discussed in previous papers\textsuperscript{15,19} and again emphasized here. The epithelial nests associated with sensory nerve fibres may simulate perineural invasion and pose a potential diagnostic problem for surgical pathologists especially when working on frozen tissue specimens from patients with oral cancer.\textsuperscript{19}

The surgeon’s responsibility to the cancer patient is to ensure that all tumour tissues are successfully removed at the first instance of surgery. The pathologist’s role is to confirm as best he or she could that this has indeed been achieved. This requires a systemic sampling of all tissues removed and meticulous examination of all surgical margins to microscopically evaluate tumour clearance. It was during this procedure that epithelial cell nests were encountered in the specimens removed from the retromolar regions of the present two cases. Whilst the importance of negative surgical margins cannot be overemphasized as it would mean a better prognostic outcome, unnecessary extensive surgery is also not justified. Therefore in the assessment of specimens removed from the pterygomandibular regions of oral cancer patients, the pathologist should exercise extreme care to distinguish neural invasion by carcinoma.

Fig. 5. Case 2. Same single epithelial island (E) (arrow) as in Fig. 1 and a few small nerve bundles (N) (arrows) . (Haematoxylin & eosin stain. Original magnification x40)
and the intraneural benign epithelial islands of the organ of Chievitz. Histologically, the juxtaoral organ of Chievitz is seen as discrete epithelial cell nests embedded in a loose fibrous connective tissue (Figs. 1-5). These epithelial cells are bland-looking, consisting of squamoid cells exhibiting peripheral polarization (Fig. 2). Cytological features of atypia are general lacking. In contrast, in neural invasion by a carcinoma, the tumour epithelium surrounding the neural elements shows cytological features of malignancy, i.e. hyperchromatic nuclei, cellular and nuclear pleomorphism, mitoses etc. As the squamous cell carcinoma is the commonest form of oral cancer, this should be the chief differential diagnostic consideration. Examples of squamous cell carcinoma with perineural involvement are shown in Figs. 6 and 7.

Fig. 6 An example of neural (N) invasion by a squamous cell carcinoma (S). The tumour epithelium formed interconnecting islands (S) (arrows) which entirely surround the nerve bundles (N) (Haematoxylin & eosin stain. Original magnification x100).

Fig. 7 Details of neural (N) invasion by a squamous cell carcinoma (S) (arrows). Note that the neoplastic tumour cells showed cytological features of malignancy. (Haematoxylin & eosin stain. Original magnification x100).
In view of the fact that the retromolar region also ranks as the third commonest site for intraoral malignant minor salivary gland neoplasms, and that 80% of salivary gland tumours arising from this area are of a malignant nature, salivary malignancies therefore constitute an important diagnostic consideration here. Of all the malignant salivary gland tumours the adenoid cystic carcinoma is most well-recognized for its propensity to show neural spread (Fig. 8). The typical cribriform growth pattern and population of small darkly-staining cells would assist in distinguishing the adenoid cystic carcinoma from the innocuous epithelial nests of the juxtaoral organ of Chievitz. The other salivary gland tumour that may exhibit a tendency towards neural involvement is carcinoma ex pleomorphic adenoma (Fig. 9).

In summary, two cases of juxtaoral organ of Chievitz are reported here to further illustrate its potential as a pitfall in oral cancer diagnosis.

Fig. 8 An example of an adenoid cystic carcinoma showing perineural invasion (N) (arrows). (Haematoxylin & eosin stain. Original magnification x200).

Fig. 9 Carcinomatous elements (E) from a case of carcinoma ex pleomorphic adenoma exhibiting perineural (N) (arrows) and perivascular (V) (arrows) invasion. (Haematoxylin & eosin stain. Original magnification x100).
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REFERENCES


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