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دراسة تشريحية ونسجية على الغدة النكفية في الأطفال حديثي الولادة

دراسة مقدمة إلى
كلية الطب – جامعة تكريت
كجزء من متطلبات الحصول على درجة ماجستير علوم في التشريح

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فرع التشريح

كلية الطب – جامعة تكريت

**AND HISTOLOGICAL STUDY ON PAROTID
GLAND OF HUMAN NEONATE**

A THESIS

SUBMITTED TO THE COUNCIL OF THE COLLEGE OF
THE MEDICINE UNIVERSITY OF TIKRIT IN PARTIAL
FULFILLMENT OF THE REQUIREMENT FOR THE
DEGREE OF MASTER OF SCIENCE IN ANATOMY

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

لَقَدْ كَفَرَ الَّذِينَ كَفَرُوا إِذْ أَخْبَرُوا بِمَا لَمْ يَكُنْ لَهُمْ بَأْسٌ وَلَا يَشْعُرُونَ
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DECLARATION

We certify that this thesis was prepared under our supervision at the college of Medicine, University of Tikrit as a partial requirement for the degree of master of Science in Anatomy.

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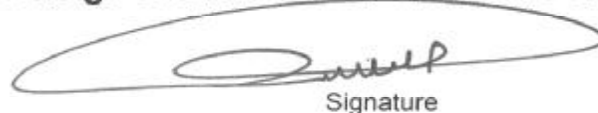
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ABSTRACT

In this study the anatomical and histological features of the parotid gland and its main duct have been investigated in a 37 neonatal cadavers who were sent for the forensic medicine unit of Saddam Teaching Hospital in Tikrit City.

For anatomical study, each cadaver was injected with 10% formalin and dissected to identify the position of the parotid gland within retromandibular fossa; it was found as an irregular ramified one mass with many extensions wedged among its closer neighboring structures.

The incidence of the small accessory parotid gland was founded in 14 out of 74 specimens. The main excretory duct of the parotid gland was emerged from anterior extension of the gland and extended within cheek tissues to open into the mouth vestibule.

External carotid artery which traverse the medial portion of the gland and its branches within the gland and their emerging from the gland, also the retromandibular vein and its tributaries which course within superficial portion of the gland but deep and in close relation to the facial nerve branches were also demonstrated.

For histological study all specimens, after preparing, were stained with haematoxylin and eosin to study the histological features of the parotid gland and its main excretory duct.

The secretory unit of the multilobulated gland was composed of acini lined with single layer of pyramidal cells, were drained by intercalated which lead to the striated duct. Intercalated and striated ducts were lined with single layer of cells also, whereas the excretory ducts were lined with pseudostratified columnar epithelium.

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الخلاصة

اجري هذا البحث لدراسة الخصائص التشريحية و النسيجية للغدة النكفية و قناتها الرئيسية في سبع وثلاثين جثة طفل مولود حديثاً ارسلت الى وحدة الطب العدلي في مستشفى صدام التعليمي في مدينة تكريت.

لدراسة التشريحية ، كل جثة حقنت بالفورمالين و شرحت لايجاد موقع الغدة النكفية في الحفرة خلف الفكية. في هذه الدراسة وجدت الغدة ككتلة غير منتظمة متشعبة ولها عدة امتدادات منحشرة بين التراكيب المجاورة لها وقناتها الرئيسية منبثقة من الامتداد الامامي للغدة و ممتدة ضمن انسجة الوجنة حتى تفتح ضمن التجويف الفموي.

الغدة النكفيه الملحقه الصغيرة الحجم وجدت في ١٤ من ٧٤ نموذج .
الاوعية الدموية للغدة ، الشريان التاجي الخارجي، الذي يمتد عبر الجزء الوسطي من الغدة و تفرعاته وظهورها من الغدة، كذلك الوريد خلف الفكوي وروافده التي تمتد ضمن الجزء الخارجي من الغدة و لكن عمقياً وقربية من تفرعات العصب الوجهي هي الاخرى تم دراستها.

لدراسه النسيجية كل النماذج بعد التحضير صبغت بصبغة الايوسين - هيموتوكسيلين لدراسة الصفات النسيجية للغده و قناتها الرئيسه . وجد ان وحدة الإفراز للغدة متعددة الفصوص مؤلفة من الحويصلة و القنوات المقتحمة و القنوات المخططة و هذه كانت مبطنه بطبقة واحدة من الخلايا بينما القنوات الإفرازية الرئيسة كانت مبطنه بطبقة متعددة من الخلايا العمودية.

CHAPTER ONE

INTRODUCTION AND REVIEW OF LITERATURE

1- 1 INTRODUCTION:

Like many omnivorous animals including primates like, bears and pigs, the human mouth is continuously bathed by saliva, a watery fluid secreted by major and minor salivary glands. The major salivary glands include: submaxillary, sublingual and parotid which lie at some distance from the oral mucous, with which they communicate through one or more extraglandular ducts. The minor salivary glands are numerous situated in mucous membrane of the lips (labial glands), cheeks (buccal glands), palate (palatine glands) and tongue (Von Ebners glands) (1,2,3,4). Over the past many decades, considerable information has accumulated about the anatomy , histology , and embryology of the parotid gland in adult and gestational stages.

Many investigators described the bilobed structure of adult parotid glands (5,6,7,8,9,10). On examining embryos and fetuses with the same intention, Gasser (7) and Espin - Ferra et al (8) found no signs of a bilobed gland. Rouviere and Cordier (6), and Burnner (10) found the opposite.

The development of the parotid gland is described by many authors As formation of a solid epithelial bud penetrating the underlying mesenchymal tissue (11,12).

Ramification of the glandular tissue was found by Lecco (13) at a crown rump length of 18 mm , by Merida-Velasco and Espin -Ferra (14) at 24mm and by Marques et al (15) in the 11th week of development.

Sanchez-Montesions and Merda Velasco (16) noted that the thickness of the parotid capsule relates to the consistency of the structures surround

the gland. Hard tissue like the skull base seems to cause a well-defined capsule while a nerve or a vessel does not. Other investigators described the relationship between the parotid gland and facial nerve without including the surrounding structures Rouviere and Cordier (6) and Gasser (7).

Since no information were available about the parotid gland and its duct in newborn including the anatomical and histological criteria neither in textbook nor midline up to recent years as far as to our knowledge, therefore this present work was undertaken as an attempt to show the anatomical position, relationships and other criteria as well as the histological appearance of the parotid gland in newborn .

1-2 Morphology, Location and anatomical relationships of parotid (Par = near, Otis = ear) gland:

Its the largest of the salivary glands located in retromandibular area and extends just 3-4 cm anterior to the external ear (17), its primary excretory duct passes through the cheek and open into the vestibule of the mouth opposite to the upper 2nd molar tooth. In adult its weight ranges from 20-30 gram, volume ranges from 12.9 – 46.4 cm³, length ranges from 3.0-8.1cm (18). It forms an irregular, lobulated, yellowish mass, laying in the fossa posterior to the ramus of mandible, extends from the external acoustic meatus above, to the upper part of the carotid triangle below (just below and behind angle of mandible), medially it extends to the side wall of the pharynx. Posteriori it overlaps the sternocleidomastoid muscle and extends anteriorly over the masseter muscle for variable distance (17,19,20,21). The body of the parotid gland fills the space between ramus of mandible and external auditory meatus and mastoid process (22). The gland lies directly on the

posterior belly of the digastric muscle, styloid process and the stylohyoid muscle (23). These structures separate the gland from the internal carotid artery, internal jugular vein and the cranial nerves I X to X II (24). Practically, these anatomic entities form the parotid bed, which is related to the so-called “deep lobe” of the parotid gland (20,22,24,25).

Parotid gland has a number of superficial and deep extensions (processes); the superficial processes are: condylar process lies close to the temporomandibular joint, metal process lies in incisure of cartilaginous portion of the external auditory canal, and posterior process projects between mastoid bone and sternocleidomastoid in a dorsal direction while the deep processes are: glenoid process resting on vaginal extension of the tympanic bone, and the stylomandibular process which projects anteromedially above the stylomandibular ligament (1, 3,24).

Parotid gland has a waist like constriction between the ramus of the mandible and masseter muscle anteriorly, and the posterior belly of the digastric muscle posteriorly , this constriction has been designated as the isthmus of the gland (22).

Gasser (7) and Espin – Ferrá et al (8) have demonstrated that the parotid gland is unilobar and there is no discrete separation into deep and superficial lobes.

The gland is like an inverted, flattened, three sided pyramid, it presents a small superior concave surface, lateral superficial surface, anteromedial and posteromedial surface while the lower part of the gland tapers to blunt apex (17).

Many studies revealed that from the superficial part of the gland, which covers the surface of the masseter muscle, a small portion of the gland, varying in size, usually, more or less detached from the gland,

lies between the zygomatic arch above, and the parotid duct below. This detached portion is named accessory part of the gland (20,23,24). The incidence of accessory parotid gland was found to be 56%, about 26% of these accessory glands were mixed gland, containing serous and mucous acini (26). Accessory parotid glands were presented in the early stages of development and persists into later life. (27).

1.3 Surface anatomy of the parotid gland: -

The anterior border of the gland is represented by a line passing downwards and forwards from the upper border of the mandibular condyle to a point just above the middle of masseter muscle, then downwards and backwards to a point about 2 cm below and behind the angle of mandible. The upper border is concave upward and backward, corresponded to a curved line drawn from the upper border of the mandibular condyle across the lobule of auricle to the mastoid process. The posterior border corresponds to straight line joining the other ends of anterior and upper borders (20,23,24).

1.4 The parotid duct: -

This is a thick –walled tube formed within the gland by the union of the minor ducts, which drain its lobules (24). It begins by the confluence of two main branches within anterior part of the gland (20). Its length varies from 35-50 mm, and 3-4 mm in diameter, the minimum diameter of the duct at its ostium within oral cavity is about 0.1mm, striking narrowing at the middle of the duct (28 , 29). On arising from anterior of the parotid gland by union of two ducts of small caliber, the parotid duct runs anteriorly and superficially crossing the masseter muscle, about 1.5cm below the zygomatic arch and parallel to it (24). On crossing the masseter muscle the parotid duct receiving from above

5-6 ducts from the accessory parotid gland, which is located between zygomatic arch above and parotid duct below (23). Also in this position of the parotid duct, the transverse facial artery lie above it, and the buccal branches of the facial nerve run parallel either superior or inferior to the duct (30). Reaching the anterior border of the masseter muscle, the duct hooks medially, passes through the corpus adiposum of the cheek, buccopharyngeal fascia, and pierces the buccinator muscle then runs for a short distance obliquely forwards between the buccinator muscle and the mucous membrane of the mouth (20) Opens upon small papilla on the oral surface opposite to the crown of the second maxillary molar tooth (1). The course of the parotid duct corresponds to the middle third of a line drawn from the lower border of the tragus to a point midway between the nose and the red margin of the upper lip (30).

1.5 Capsule of the parotid gland: -

The gland is enclosed within a capsule derived from the investing fascia of the deep cervical fascia (23). The investing fascia between the styloid process and the angle of mandible encloses the parotid gland (24).

The fascia splitting into, superficial layer passes superiorly over the surface of the gland to attach to the zygomatic arch; anteriorly it merges with the tissue of cheek (31). Whereas the deep layer of the investing fascia form the deep part of the capsule, attached to styloid process, mandible and tympanic plate, and blends with fibrous sheaths of the muscles related to the gland (23). The superficial layer is dense closely adherent to gland, sends into the gland deep septal extensions that become continuous with the stroma of the gland along the branches of the facial nerve (22). The deep portion of the parotid fascia, which extends between the styloid process and the angle of mandible,

thickened to form the stylomandibular ligament (1). The stylomandibular ligament with the portion of deep fascia, which passes downward to fuse with the fascia of the posterior belly of the digastric muscle and angle of mandible, serves to separate the parotid gland from the submandibular gland (24). The parotid gland is fixed by fibrous attachment to external acoustic meatus, mastoid process and the fibrous sheath of the sternocleidomastoid muscle (32). The superficial muscular aponeurotic system (SMAS) closely applied to the superficial surface of the parotid gland, a thin but distinct parotid fascia can be identified between parotid gland and SMAS (33). The SMAS terminates superiority within 1cm below the zygomatic arch, anteriorly lies in continuity with orbicularis oculi muscle of the lower eyelid, while in mid face lateral to the mouth the SMAS become thin and leave small aperture lateral to mouth, (34,35). Superficial to the SMAS is the subcutaneous and skin covering the parotid gland (23).

1.6 Blood vessels of the parotid gland: -

1.6.1 External carotid artery: -

Appears inferomedially to the parotid gland, then grooves the posteromedial surface of the gland before it enters its substance (23). Within the gland, it divides into maxillary and superficial temporal arteries at the junction between the middle and upper thirds of the parotid gland at the level of angle of mandible (31). The superficial temporal artery gives off the transverse facial artery to supply the face, before continuing up wards between the temporomandibular joint and external acoustic meatus within the gland and emerges from the upper border of the gland to supply the temple (24). The maxillary artery passes forward and slightly upward behind the condylar neck in the part of the parotid gland laying deep to it, then the artery emerges from

anteromedial surface of the gland and passes into the infratemporal fossa (21). The retroauricular artery (posterior auricular) may start from the external carotid artery within the gland, and it then leaves the latter on its postero medial surface (20,23,36).

1.6.2 Venous drainage :-

The superficial temporal vein enters the superior surface of the parotid gland and receives the internal (maxillary) vein, which enters the gland at the points of exits of the corresponding artery (23). Thus the retromandibular (posterior facial) vein is formed in upper part of the gland (26). The retromandibular vein is superficial to the intraglandular part of the external carotid artery and deep to the facial nerve (37)

After short course within the gland medial to main subtrunks of facial nerve within 5 mm from point of facial nerve branching (38). It divides into posterior branch, which leaves the gland through its inferior extremity and joins the posterior auricle vein to form the external jugular vein, and anterior branch, which leaves the gland through its inferior extremity also and joins the common facial vein (39).

1.7 Lymphatic drainage: -

The parotid gland is intimately associated with a network of lymphatic vessels and nodes connecting the various region of the head and neck area (40). Parotid gland has 20 to 30 lymph follicles and lymph nodes (41). The lymphatic vessels and nodes can be divided into superficial, intraglandular and subglandular systems (42). The superficial group of vessels and nodes (paraglandular) is located in the subcutaneous layer of skin on the fascia of the parotid gland, immediately anterior to the tragus and are 1 to 3 lymph nodes in number (43). The afferent vessels that pass to lymph nodes in this group

originate from the lateral surface of the auricle and the skin of the adjacent temporal region, efferent vessel of this group pass to the superior deep cervical lymph nodes (23).

Lymph nodes and vessels enmeshed in the parenchyma of the parotid gland are referred to as the intraglandular lymphatic system, its lymph nodes number vary from 2-22. (44). Their presence is 100% of parotid glands, mainly located in superior lobe (45). Afferent lymphatic vessels of the intraglandular nodes drain the root of the nose, eyelids, fronto temporal area, external meatus of the ear and middle ear, and occasionally from the palate and the nose (20). The efferent vessels from the intraglandular portion of parotid lymphatic system pass to the superior deep cervical lymph nodes (23). The subglandular group of lymphatic and nodes lie in the lateral wall of the pharynx, on deep portion of the gland or embedded in it, their incidence is about 75% of deep portion of parotid glands, their number range from 0 to 4 lymph nodes (44). The afferent vessels of the subglandular group drain the nasopharynx and the posterior nasal cavities while the efferent vessels drain to the superior cervical nodes (40).

1.8 Nerves which traverse the parotid gland: -

1.8.1. Great auricular nerve:

This cutaneous nerve is the largest of the ascending branches of cervical plexus; it arises from the ventral rami of the second and third cervical nerves (23). It appears along the posterior border of the sternocleidomastoid muscle at its mid point, pierces the deep fascia ascends upon that muscle beneath the platysma muscle in accompany with the external jugular vein (26). It passes to the parotid gland when it divides into an anterior and posterior branch (3,31). The anterior branch

is distributed to skin over the gland and communicates in substance of the gland with facial nerve and auriculotemporal nerve (46).

1.8.2. Auriculotemporal nerve:

Generally it arises by two roots, which encircle the middle meningeal artery (13). It crosses the tensor veli of palatini, passes backwards behind the temporomandibular joint, in relationship with the upper part of parotid gland, behind the joint, posterior to the superficial temporal vessels, crossing the posterior root of the zygoma, ended in temple area by dividing into branches (2). The auriculotemporal nerve communicates with facial nerve and otic ganglia (24). It gives branches to external acoustic meatus, articular, parotid gland, and temple (22).

The parotid branches convey secretomotor fibers to the parotid gland, postganglionic parasympathetic nerve fibers from cells of otic ganglion, preganglionic fibers reach the otic ganglion from the glossopharyngeal nerve through its tympanic branch and travel by the lesser petrosal nerve to otic ganglia (20).

The parotid branches of auriculotemporal nerve also convey the vasomotor (sympathetic) fibers to the blood vessels of the parotid gland, these postganglionic fibers arise in the superior cervical ganglion and pass to the middle meningeal artery to form plexus from which pass to the otic ganglion without being interrupted, emerge with the parasympathetic fiber to supply the blood vessels of parotid gland (13). Clinical investigations, however, have led to the conclusion that the human parotid gland also receives secretomotor fibers through the chorda tympani (47)

1.8.3 Facial nerve (VII Cranial nerve)

Possesses motor and sensory roots, both roots appear from pons, motor root supply muscles of face, auricle and scalp, while sensory root convey fibers of taste from tongue and soft palate (23). In addition to the preganglionic parasympathetic (secretomotor) innervation of the submandibular, sublingual, lacrimal and glands of nasal and palatine mucosa (20). The facial nerve, after traversing the temporal bone exists at the base of skull through the stylomastoid foramen, which is located posterior to the base of styloid process and anteromedial to the mastoid process (32). The nerve then courses anterolaterally gives branches to the posterior auricular muscle, the posterior belly of the digastric muscle, and the stylohyoid muscle before traversing the parotid gland (24).

The nerve entering the parotid gland through the isthmus of the posteromedial surface (48). Its course through the parotid gland can be represented by a short horizontal line drawn across the upper part of the lobule of auricle (32). As the nerve enters the gland, it becomes superficial and in close relationship to the retromandibular vein (posterior facial vein) while the external carotid artery courses more deep within medial portion of the gland (39). The nerve, before reaching the retromandibular vein (not less than 5 mm), divides into two divisions, the upper is temporofacial and lower is cervicofacial (49). The point of branching is known as the pes-anserinus (22). The length of the facial nerve trunk from stylomastoid foramen to the point of branching is ranged from 13 – 24 mm in adult (50). Temporofacial branch takes vertical course while cervicofacial branch is a transverse continuation of the main trunk (51). From these two main divisions branching occurs within the gland in a variable fashion with at least five branches being found, temporal, zygomatic, buccal, mandibular, and