In the human, there are three Chief paired salivary glands: the parotid, the submandibular and sublingual, along with several hundred minor salivary glands distributed submucosally throughout all sites of the head and neck (most commonly in the oral cavity).

4.1.2 Parotid Glands

4.1.2.1 Embryology

Each parotid gland develops from a thickening of buccal epithelium. This thickening extends posteriorly towards the ear in a plane superficial to the developing facial nerve. By the third month of embryonic life, the deep aspect of the parotid gland produces bud-like projections between the branches of the facial nerve. These projections merge to form the deep lobe of the gland. By the sixth month, the gland is completely canalised.

4.1.2.2 Anatomy

The parotids are the largest of the major salivary glands. Each is a compound, tubuloacinar, mepocrine, exocrine gland, and it is composed entirely of serous output—producing acini.

Each gland is located in its respective space between the posterior border of the mandibular ramus and the mastoid process of the temporal bone. The external auditory meatus and the temporomandibular joint, with the glenoid fossa and the zygomatic process of the temporal bone, lie posteriorly and superiorly to the gland. Each gland is usually located inferiorly in the neck, sometimes as low as the hyoid. On the deep (medial) surface of each lies the styloid process of the temporal bone. Inferiorly, the parotids frequently overlap the angles of the mandibles, and their deep surfaces overlie the transverse processes of the atlas (C1) vertebra.

Each gland is frequently triangular shaped, with the apex directed inferiorly. On average, the gland is 6 cm in length, with a maximum width of 3.3 cm. In approximately 20% of the population, a smaller accessory lobe arises from the upper border of each parotid duct, approximately 6 mm anterior to the main gland. These accessory lobes overlie the zygomatic arches.

Each gland is surrounded by a fibrous capsule. This fascia passes up from the neck; it was originally thought to separate to enclose the gland. The deep layer is attached to the mandible and the temporal bone at the tympanic plate and the styloid and mastoid processes. This superficial layer is now considered part of the superficial musculoaponeurotic system (SMAS). Anteriorly, the superficial layer of each parotid capsule is thick and fibrous, but more posteriorly, it becomes a thin, translucent membrane. Within this fascia are scant muscle fibres running parallel with those of the platysma muscle. This superficial layer of the parotid capsule appears to be continuous with the fascia overlying the platysma muscle. This superficial layer of the parotid capsule appears to be continuous with the fascia involving the platysma muscle.

The superior border of each parotid gland is closely attached to the temporomandibular joint, and it encircles the external auditory meatus. An avascular plane exists between the gland capsule, and the cartilaginous and bony acoustic meatus. The inferior border (usually the apex) is at the angle of the mandible, and often extends beyond this to overlap the digastric triangle, where it may lie close to the posterior pole of the submandibular salivary gland. The anterior border just overlaps the posterior border of the masseter muscle, and the posterior border overlaps the anterior border of the sternocleidomastoid muscle.

The superficial surface of each gland is covered by skin and platysma muscle. Some terminal branches of the great auricular nerve also lie superficially to the gland tissue. At the superior border of each parotid lie the superficial temporal vessels, with the artery situated anteriorly to the vein. The auriculotemporal branch of the mandibular nerve runs at a deeper level, just behind the superficial temporal vessels.

The branches of the facial nerve emerge from the anterior border of the gland. The parotid duct also emerges to run horizontally across the masseter muscle, before piercing the buccinators muscle anteriorly, to end at the parotid papilla. The transverse facial artery (a branch of the
4.1 Salivary Gland Anatomy

superficial temporal artery) runs across the area parallel to, and approximately 1 cm above, the parotid duct. The anterior and posterior branches of the facial vein emerge from the inferior border.

The deep (medial) surface of each parotid gland lies on structures collectively called the parotid bed. Anteriorly, the gland lies over the masseter muscle and the posterior border of the mandibular ramus, from the angle up to the condyle. Where the gland encircles the ramus, it is related to the medial pterygoid muscle at its insertion onto the deep aspect of the angle. More posteriorly, the parotid is moulded around the styloid process and the styloglossus, stylohyoid and stylopharyngeus muscles from below, upwards. Behind this, the parotid lies on the posterior belly of the digastric muscle and the sternocleidomastoid muscle. The digastric and the stylohyoid muscles separate the gland from the underlying internal jugular vein; the external and internal carotid arteries; and the glossopharyngeal, vagus, accessory and hypoglossal nerves, and the sympathetic chain.

The fascia that covers the muscles in the parotid bed thickens to form two ligaments. The stylomandibular ligament passes from the styloid process to the angle of the mandible. The mandibulo-stylohyOID ligament (the angular tract) passes between the angle of the mandible and the stylohyoid ligament; inferiorly, it usually extends down to the hyoid bone. These ligaments are all that separate the parotid gland anteriorly from the posterior pole of the submandibular gland superficial lobe.

4.1.2.3 Contents of Parotid Glands

From superficial to deep layers, the facial nerve, the auriculotemporal nerve, the retromandibular vein and the external carotid artery pass through the gland.

4.1.2.3.1 Facial Nerve

Each facial nerve enters the head from the temporal bone, or skull base, at the stylomastoid foramen. The nerve lies about 9 mm from the posterior belly of the digastric muscle, and 11 mm from the bony external meatus. The facial nerve trunk then passes downwards and forwards over the styloid process and associated muscles for about 1.3 cm, before entering the body of the parotid gland. The first part of the facial nerve produces the posterior auricular nerve, supplying the auricular nerve innervating the auricular muscles as well as branches to the posterior belly of the digastrics and stylohyoid muscles.

Inside the parotid gland, the facial nerve separates into two branches, temporofacial and cervicofacial. The division of the nerve is referred to as the pes anserinus (“goose foot”). From these two branches, the facial nerve further divides into five further branches: temporal, zygomatic, buccal, mandibular and cervical. The peripheral branches of the facial nerve form anastomosis between adjacent branches to form the parotid plexus. Davis et al. studied these patterns in 350 cadaveric facial nerves and described six patterns. They demonstrated that in only 6% of cases were there any anastomosis between the mandibular branch and the adjacent branches.

4.1.2.3.2 Auriculotemporal Nerves

Each auriculotemporal nerve arises from the posterior division of the mandibular division of the trigeminal nerve in the infratemporal fossa. It runs backwards, beneath the later pterygoid muscle, between the medial aspect of the condylar neck and the sphenomandibular ligament. It enters the parotid gland on its anteromedial surface, passing upwards and outwards to emerge at the superior border of the gland, between the temporomandibular joint and the external acoustic meatus. This nerve communicates extensively with the temporofacial division of the facial nerve and limits the mobility of the facial nerve during surgery.

4.1.2.3.3 Parotid Lymph Nodes

Lymph nodes are found within the subcutaneous tissues overlying the parotid to form the preauricular nodes, and within the substance of the gland. Typically, most of these nodes within the gland are located laterally to the facial nerve. There are few nodes reported in the deep lobe of the parotid gland. All the parotid nodes drain into the upper deep cervical chain.

4.1.2.3.4 Parotid Ducts

Each parotid duct emerges from the anterior border of the parotid gland and passes horizontally across the masseter muscle. If an invisible line were drawn from the alar base to the commissure, the surface markings of the duct would be delineated by another line running from the tragal cartilage to bisect the alar base–commissure line. The middle third of this line is the surface marking of the parotid duct. Anastomosing branches between the buccal and zygomatic branches of the facial nerve cross the duct. At the anterior border of the masseter, the duct bends sharply to perforate the buccal pad of fat and the buccinators muscle at the level of the second molar teeth. The duct then bends again to pass forwards for a short distance before entering the oral cavity at the parotid papilla.

4.1.2.4 Nerve Supply to the Parotid Glands

The parasympathetic secretomotor nerve supply comes from the inferior salivary nucleus in the brain stem. From there, fibres extend to the tympanic branch of the glossopharyngeal nerve, contributing to the tympanic plexus in the middle ear. The lesser petrosal nerve arises