Extraoral anatomy in CBCT –
a literature review

Part 1: Nasoethmoidal region

KEYWORDS
Anatomy
CBCT
Nasal cavity
Ethmoid bone

SUMMARY
Cone beam computed tomography has become a widely used imaging technique for dental indications. Depending on the selected size of the field of view, anatomical structures outside the den-
tomaxillary complex become visible. As a conse-
quence, the clinician must be able to interpret also those anatomical regions. In this article, the anatomy of the nasoethmoidal region is present-
ed based on a literature review. The nose is char-
acterized by the nasal septum and the superior, middle, and inferior conchae. The turbinates may be pneumatized (concha bullosa), mainly the middle concha. The ethmoid bone has a complex morphology (ethmoid labyrinths) and contributes with its perpendicular plate to the nasal septum. Other structures of the septum include the vomer and the septal cartilage. The nasal meatuses sta-
bilize the airflow and direct the inhaled air to the nasopharynx via the choanae. The middle nasal meatus, which is also a part of the so called os-
tiomeatal complex, serves as the major drainage area (semilunar hiatus) of the paranasal sinuses, i.e., maxillary sinus, anterior ethmoid cells, and frontal sinus. Posterior ethmoid cells empty into the superior meatus and the sphenoid sinus drains into the sphenoethmoidal recess, located above the superior concha. The nasolacrimal duct that is running along the middle portion of the lateral nasal wall opens into the inferior nasal meatus.
Introduction
Knowledge of anatomical structures and their spatial relationships is critical in medicine and dentistry for diagnosis and treatment planning (von Arx & Lozanoff 2017). Current medical and dental curricula teach anatomy at the very beginning of training in the undergraduate phase. As a consequence, anatomical knowledge may be gradually or selectively lost over the years of clinical work.

Over the course of the last two decades, cone beam computed tomography (CBCT) has become the standard of three-dimensional imaging in dentistry. Main indications for using CBCT in the various disciplines of dental medicine have recently been established by the Swiss Association of Dentomaxillofacial Radiology (Dula et al. 2014, 2015). Maxillofacial surgery, ophthalmology and otorhinolaryngology are other specialties with an increased interest in CBCT (Bremke et al. 2010; Tschopp et al. 2014; Lata et al. 2018).

Nevertheless, CBCT has been reported to have also some shortcomings in comparison with advanced medical imaging procedures such as multi-slice computed tomography (msCT) or magnetic resonance imaging (MRI). This especially applies to the lack of a diagnostically distinct soft tissue contrast, narrowing down the diagnostic potential of CBCT imaging and limiting potential applications for soft tissue integration in presurgical planning (Jacobs et al. 2018). Furthermore, Hounsfield units do not apply to CBCT images, which makes it impossible to compare grey values among or within patients over time. This lack of standardized grey value distribution narrows down the use of CBCT for bone density analysis and follow-up of bone density changes (Pauwels et al. 2015). Compared to Hounsfield units for medical CT, the reliability of CBCT-based jaw bone density assessment has been found unreliable over time and with significant variations influenced by CBCT devices, imaging parameters and head positioning.

Currently, the vast majority of case-based CBCT imaging includes dental and maxillofacial indications (de Vos et al. 2009). However, in larger fields of view (FOVs ≥ 10 × 10 cm), anatomical structures outside the oral cavity become visible (Bornstein et al. 2014). The clinician evaluating CBCT scans must assess and understand the relevant anatomy, but is also responsible for recognizing abnormalities within the complete image data set and beyond the region of interest (Carter et al. 2008; Horner et al. 2009).

The objective of this series of publications entitled “Extraoral anatomy in CBCT” is to provide a literature update with detailed information about anatomical structures usually seen on larger FOVs that may be less easily identified by the dental practitioner. The clinician remains responsible for incidental findings in the CBCT image stack. This series of reviews is intended to refresh the dental practitioner’s anatomical knowledge base facilitating accurate assessment and ultimately improving the health of the patient. The first topic in this series addresses the nasoethmoidal region.

Nose
The nose includes the visible outer structures, such as the nasal wings and the nasal dorsum, and the nasal cavities internally. The skeletal framework of the nose is osseous (upper part) as well as cartilaginous (lower and lateral parts) (Fig. 1 and 2) (von Arx et al. 2018a). The two small and flat nasal bones form the central part of the nasal root that is supplemented laterally by the frontal processes of the os maxillae. Several cartilages contribute to the...
lower portion of the nose. The central nasal ridge is formed by the superior margin of the septal cartilage. The nasal wings consist of the triangular-shaped lateral cartilages, also called upper lateral cartilages. These cartilages project superiorly below the nasal bones and attach through dense connective tissue (Ogle et al. 2012). The edges of the nasal orifices, or nostrils, and the columna are formed by the scroll-shaped alar cartilages (also called lower lateral cartilages) that form the curved external openings of the nose (Hafezi et al. 2010). Each lower lateral cartilage has a medial and a lateral crus that shape the nasal tip and maintain the patency of the nostrils (Ogle et al. 2012). Additional small cartilages contribute variably to the nasal wings and include the minor alar cartilages or sesamoid cartilages.

Nasal cavity
The nasal cavity is a bilateral structure located in the midface (Fig. 3–12). Inferiorly it is bordered by the hard palate while the roof of the nasal cavity is formed by the cribiform plate of the ethmoid bone. A midline septum oriented in the sagittal plane divides the nasal cavity into two bilateral cavities. Anteriorly, the nasal vestibules positioned outside the osseous part of the nose serve as the communication from the nostrils to the proper nasal cavities. The nasal cavities have anterior (ventral) openings, i.e., the nostrils (or nares), and posterior (dorsal) openings, i.e., the choanae. The latter represent the gateway to the nasopharynx.

Major functions of the nose include respiration and olfaction. Hairs (vibrissae) located in the vestibule have a cleaning function, whereas the nasal mucosa warms and humidifies the inhaled air. The nasal conchae enlarge the functional mucosa of the nasal cavities. Olfactory cells are mainly located on the upper conchae.

The three nasal conchae, superior, middle, and inferior, also termed nasal turbinates (“turbid” from Latin to disturb), exhibit a scrolled cross-section in the coronal plane with the free end directed laterally. Occasionally, a paradoxical curvature, mainly of the middle turbinate, is observed, i.e., the turbinate is scrolled in a medial direction (Sava et al. 2018). The inferior concha typically is the largest while the superior is the smallest. Rarely, a fourth concha suprema (Santorini’s concha) is described that is located at the posterolateral aspect of the lateral nasal wall close to the lateral margin of the ostium of the sphenoidal sinus (Sava et al. 2018). The term “concha bullosa” generally refers to the pneumatization of the middle turbinate. However, pneumatization may also occur of the superior and inferior turbinates (Ila et al. 2018). In fact, the presence of a “void” within the concha(e) is an optical illusion on 2D pictures, since the “pneumatized” cavity always presents with a connection to the corresponding nasal meatus.

The three conchae divide the nasal cavities into four spaces, i.e., from top to bottom, sphenoethmoidal recess, superior nasal meatus, middle nasal meatus, and inferior nasal meatus. The middle meatus is the most complex and serves as the major drainage area of the paranasal sinuses (Ogle et al. 2012). The four air channels on each side divide and compartmentalize airflow. Furthermore, they increase and stabilize airflow pressure and velocity while also directing the air to the nasopharynx via the choanae (Doory et al. 2008).

The ostiomeatal complex is the functional unit of the anterior ethmoid including the maxillary ostium, the middle meatus, the hiatus semilunaris, the uncinate process, and the bulla ethmoidalis (Gibelli et al. 2018). The ostiomeatal complex is con-
considered a critical area for paranasal ventilation and drainage since it is located at the crossroads between the nasal cavities and the paranasal sinuses (Khojastepour et al. 2015).

The paranasal sinuses, i.e., frontal sinus, sphenoid sinus, ethmoid cells, and maxillary sinus, drain into the meatuses via distinguished openings or ostia. The largest gateway is the maxillary ostium serving as the communication between the maxillary sinus and the middle meatus. The maxillary ostium is located in the lower part of the semilunar hiatus, a broad and curved opening within the lateral nasal wall located between the inferior and middle turbinates. Also the frontal sinus drains into the middle meatus with its ostium located in the upper part of the semilunar hiatus. Multiple small openings serve for drainage of the ethmoid air cells (see below).

A structure not related to the paranasal sinuses but still draining into the nasal cavity is the nasolacrimal duct. It originates from the lacrimal sac at the anteroinferior corner of the orbital cavity. The nasolacrimal duct terminates in the anterior third of the inferior nasal meatus (Wilhelm et al. 2009; Tschopp et al. 2014; Bornstein et al. 2017a). The bony nasolacrimal canal is usually inclined posteriorly and laterally toward the maxillary first molar (Ali et al. 2014). In a study with 15 cadaveric human half heads, the mean length of the nasolacrimal duct was 21.9 mm and its intranasal orifice was located on average 13.7 mm above the nasal floor (Tatlisumak et al. 2010).

Nasal floor

The nasal floor is formed by the same osseous structures that contribute to the hard palate, i.e., the palatine processes of the os maxillae (anteriorly) and the horizontal plates of the palatine bones (posteriorly). Ventral and dorsal midline bony projections at the level of the nasal floor include the anterior and posterior nasal spines. In a study of 50 embalmed cadaver hemiheads, the mean distance from the anterior to the posterior nasal spines was 5.6 ± 0.3 cm (Donmez et al. 2005). The nasal crest is located above the fusion zone of the palatal processes of the os maxillae and the os palatinum. Prominent, funnel-shaped bilateral openings are located along the anterior nasal crest and serve as the nasal openings of the nasopalatine canal.
Fig. 7 CBCT of a 34-year-old female (original FOV 10 × 10 cm) with coronal (A), sagittal (B) and axial (C) views.

1 = nasolacrimal duct; 2 = inferior meatus; 3 = inferior concha; 4 = maxillary sinus; 5 = septal cartilage; 6 = nasal crest; 7 = perpendicular plate of ethmoid bone; 8 = anterior ethmoid cells; 9 = posterior ethmoid cells; 10 = sphenoid sinus; 11 = frontal process of os maxillae; 12 = middle concha

Fig. 8 CBCT of a 66-year-old male (original FOV 10 × 10 cm) with coronal (A), sagittal (B) and axial (C) views.

1 = inferior concha; 2 = inferior meatus; 3 = middle concha; 4 = middle meatus; 5 = superior concha; 6 = superior meatus; 7 = sphenoethmoidal recess; 8 = perpendicular plate of ethmoid bone; 9 = vomer; 10 = nasal crest; 11 = maxillary sinus; 12 = posterior ethmoid cells (*Onodi cell); 13 = anterior ethmoid cells; 14 = inferior orbital fissure; 15 = optic canal; 16 = superior orbital fissure; 17 = sphenoid sinus. Note that both maxillary sinuses demonstrate sphenical mucosal thickenings on the floor (Fig. A).
Fig. 9  CBCT of a 20-year-old female (original FOV 10 × 10 cm) with coro-
nal (A), sagittal (B) and axial (C) views
1 = “sinus septi nasi”; 2 = sphenoid sinus (*extension of sphenoid sinus into
nasal septum); 3 = maxillary sinus; 4 = vomer; 5 = perpendicular plate of
ethmoid bone; 6 = nasopalatine canal; 7 = superior concha; 8 = middle
concha; 9 = inferior concha; 10 = nasolacrimal duct

Fig. 10  CBCT of a 67-year-old female (original FOV 10 × 10 cm) with coro-
nal (A), sagittal (B) and axial (C) views
1 = nasolacrimal duct; 2 = inferior orbital fissure; 3 = infraorbital canal;
4 = middle concha (extensively pneumatized); 5 = inferior concha; 6 = maxil-
lary sinus; 7 = sphenoid sinus; 8 = hypophyseal fossa
The lateral walls of the proper nasal cavities consist of the os maxillae (anterior as well as inferior parts), the vertical plate of the palatine bone (posterior part), and the ethmoid bone (superior part). Furthermore, the small lacrimal bone also contributes to the lateral nasal wall roughly in the center portion.

Larger openings in the lateral wall include the semilunar hiatus and the sphenopalatine foramen. The sphenopalatine foramen is either located at the posterior transition of the superior and middle meatus or posteriorly within the superior meatus (El-Shaarawy & Hassan 2018; Eördögh et al. 2018). The sphenopalatine foramen serves as the communication between the pterygopalatine fossa and the nasal cavity (von Arx & Lozanoff 2017). Two superior processes of the vertical plate of the palatine bone contacting the sphenoid bone form the sphenopalatine foramen (Morton & Khan 1991). The mean diameter of the sphenopalatine foramen has been reported to be 5.3 mm (Hwang et al. 2011). According to a skull study by Prades et al. (2008), the sphenopalatine foramen is positioned on average 13 mm above the horizontal lamina of the inferior concha and 18.3 mm above the horizontal plate of the palatine bone.

The semilunar hiatus is located approximately in the central area of the lateral nasal wall at the level of the middle nasal meatus and laterally to the middle concha. The semilunar hiatus has a horizontal inferior (posterior) and a vertical superior (anterior) component (Stammberger & Kennedy 1995), thus it shows an ascending crescent shape but may exhibit great morphologic variability (Dahlstrom & Olinger 2014). The latter authors quantified the width and length of the semilunar hiatus in 97 hemisected embalmed human heads. The mean width at the superoanterior border was 1.7 mm and at the infero-posterior border 4.7 mm, whereas the mean length was 26 mm. The following structures drain into the semilunar hiatus: the frontal sinus into the superior aspect, the anterior ethmoid cells into the middle aspect, and the maxillary sinus via the maxillary ostium into the inferior aspect of the semilunar hiatus.

Areas of the lateral nasal wall in which no bone exists are called “nasal fontanelles” (Stammberger & Kennedy 1995). The mucosa of the maxillary sinus and of the middle nasal meatus are only separated by a fibrous layer. The nasal fontanelles are
usually located above the insertion of the inferior concha with distinction of an anterior and a posterior fontanelle.

**Inferior concha**
The inferior nasal turbinate is considered an independent bone that articulates with the maxilla, palatine, ethmoid and lacrimal bones. It is the largest of all three conchae and extends along the entire length of the nasal cavity (Göge et al. 2012). The inferior nasal concha displays a complex morphology with long processes including the ethmoidal, lacrimal and maxillary articulating with adjacent bones while also forming a portion of the medial wall of the maxillary sinus as well as the nasolacrimal duct. Pneumatization of the inferior concha is a rare condition with a reported frequency of 1% (Shpilberg et al. 2015; Koo et al. 2017).

**Nasal septum**
The nasal septum is a mixed osseous and cartilaginous structure and it is composed of five parts (Fig. 13) (Ogle et al. 2012):

- Perpendicular plate of ethmoid bone
- Vomer
- Septal cartilage
- Nasal crest of maxillary bones
- Nasal crest of palatine bones

The vomer and the ethmoid bone contribute to the osseous, posterior part of the septum. The anterior part of the septum comprises the septal cartilage that articulates with the nasal crest.

Surface area mapping of the nasal septum using CT in 100 Caucasian patients revealed the following mean figures for males and females: vomer 894 mm$^2$ and 741 mm$^2$, perpendicular plate of ethmoid bone 1,084 mm$^2$ and 975 mm$^2$, septal cartilage 768 mm$^2$ and 713 mm$^2$ (Kim et al. 2010b). The calculated mean total surface areas were 28 cm$^2$ in males and 25 cm$^2$ in females.

According to Hur et al. (2016), the nasal crest contributes 5.6% to the surface area of the nasal septum. In contrast, the perpendicular plate of the ethmoid bone represents 43.0%, the vomer 25.8% and the septal cartilage 25.6% of the septal surface area. The same authors also reported in 74.3% of the evaluated specimens the presence of an elevated premaxillary wing that extended from the os maxillae upwards between the septal cartilage and the vomer.

Nasal septal deviation is a common finding with frequencies ranging from 14 to 80% (Koo et al. 2017). Nasal septal deviation is defined as any bending of the septal contour in the coronal or axial planes (Shpilberg et al. 2015). The deviation of the septum occurs usually at the union of the vomer either with the perpendicular plate of the ethmoid bone or with the septal cartilage, respectively (Hur et al. 2016). The presence of a nasal septal deviation is often associated with the occurrence of a unilateral concha bullosa (middle turbinate), or a prominent bulging concha in the case of bilateral conchae bullosae (Stallman et al. 2004). As a result, the deformed septum shows a convexity to the opposite side with regard to the widened middle concha, but the air channel between the deviated septum and the enlarged concha is preserved.

**Septal cartilage**
The septal cartilage, quadrangular or triangular in shape, extends anteriorly to the anterior nasal spine to which it is attached via loose connective tissue fibers (chondrosomal junction), thus allowing some mobility (Hafkamp et al. 1999). Sometimes, the septal cartilage shows a posterior (sphenoidal) process projecting between the vomer and the perpendicular plate of the ethmoid bone (Hur et al. 2016). This sphenoidal process is considered a remnant tail of the septal cartilage resulting from delayed ossification of the nasal septum (Kim et al. 2012). The mean length of the posterior (sphenoidal) process in patients with a deviated nasal septum was 26.1 ± 5.3 mm versus 12.0 ± 2.4 mm in controls (Kim et al. 2010a). A long posterior (sphenoidal) process appears to contribute to exacerbation of septal deviation (Kim et al. 2012).

Hwang et al. (2010) assessed the size and thickness of the septal cartilage in 15 Korean cadavers. They reported a mean length and height of 3.31 ± 0.53 cm and 2.99 ± 0.47 cm. The thickness of the septal cartilage showed great variability (0.7–3.0 mm) depending on the site of measurement. Generally, the greatest thickness was observed at the septal base. The septal cartilage may show a bulge in its central area, called the nasal septal body or septal turbinate (Elwany et al. 2009). The septal body is usually located superior to the inferior concha and anterior to the middle concha.

**Vomer**
The vomer forms the inferior part of the bony septum, but extends posteriorly up to the body of the sphenoid bone. Occasionally, bilateral cavities (“fetal remnants”) are observed endoscopically at the anterior bottom of the vomer close to the nasal openings of the nasopalatine canal (Trotier 2011). The

Fig. 13 Graphic illustration of the nasal septum (right side) and adjacent structures
1 = perpendicular plate of ethmoid bone; 1a = cribriform plate of ethmoid bone; 2 = septal cartilage; 2a = posterior (sphenoidal) process of septal cartilage; 3 = vomer; 3a = vomeronasal cavity; 4 = nasal crest of maxillary bone; 5 = nasal crest of palatine bone; 6 = anterior nasal spine; 7 = nasopalatine (incisive) canal; 8 = medial plate of pterygoid process of sphenoid bone; 9 = sphenoid sinus; 10 = frontal sinus; 11 = nasal bone
The middle and superior turbinates are components of the ethmoid bone. The superior concha is located in the posterior third of the nasal cavity, with its anterior and highest portion opposite the medial canthal tendon (Ogle et al. 2012). The concha bullosa, i.e., the pneumatized middle nasal turbinate, is considered a normal and asymptomatic variant with reported frequencies of 13 to 53% (Koo et al. 2017). Pneumatization of the superior turbinate has also often been described with prevalences ranging from 26 to 57% (Shpilberg et al. 2015). Ila et al. (2018) evaluated CT scans of 1,000 patients and reported pneumatization of the superior concha in 14.9%. Of those patients, 60.4% also presented pneumatization of the middle concha. A study by Koo et al. (2017) of 594 CT scans reported a frequency of superior and middle turbinate pneumatization of 38.7% and 53.7%, respectively.

The ethmoid bulla is a protuberance lateral to the middle meatus and transmits drainage accordingly. The uncinate process of the ethmoid bone projects inferolaterally, contributes to the lower border of the semilunar hiatus, and may contact the inferior concha. Superiorly, the uncinate process may attach to the lamina papyracea, the skull base, or the middle turbinate (Cheng et al. 2017). Occasionally, pneumatization of the uncinate process (uncinate bulla) has been reported (Bolger et al. 1990; Koo et al. 2017).

Ethmoid air cells (ethmoid labyrinth) that contribute to the medial walls of the orbital cavities. The basal lamina of the middle turbinate divides the ethmoid cells into anterior and posterior divisions (Ogle et al. 2012). Many authors traditionally describe a middle ethmoid air cell creating the projection of the ethmoid bulla extending into the middle meatus (Perez-Pinaz 2000; Drake et al. 2015). However, currently accepted guidelines for terminology of the paranasal sinuses indicate that the expressions “middle ethmoid” and “middle ethmoid cells” should not be used, because in terms of anatomy, physiology, or function, no structure represents the middle of the ethmoid complex (Stammberger & Kennedy 1995).

The ethmoid sinus is highly variable in form and structure as well as in the quantity of air cells (Zhang et al. 2007; Liu et al. 2018). Typically, seven smaller anterior cells and four larger posterior cells are present (Ogle et al. 2012). Anterior ethmoid air cells drain into the middle meatus whereas posterior ethmoid cells drain into the upper meatus and into the sphenethmoidal recess, respectively. Anatomical variants of the ethmoid air cells have been reported extensively (Wormald 2003; Stallman et al. 2004; Shpilberg et al. 2015; Cheng et al. 2017; Chmielik & Chmielik 2017; Liu et al. 2018) and include:

- **Agger nasi cell** (occurrence rate 3–100%): (agger in Latin means “mound”): defined as the most anteriorly placed frontal ethmoid cell that is located anterolateral and inferior to the frontal recess (the latter refers to the tubular space connecting the frontal sinus to the middle nasal meatus) (Fig. 6). According to Ogle et al. (2012), agger nasi cells lay below the lacrimal sac from which they are separated by only a very thin layer of bone.

- **Haller’s cell** (occurrence rate 2–45%): (named after Albrecht von Haller, Swiss physician and anatomist, 1708–1777): infraorbital ethmoid cell located below the medial orbital floor and above the maxillary ostium (Fig. 11). According to Caversaccio et al. (2011), Haller’s cell should be defined as an anterior ethmoid cell, localized in the infraorbital region, hollowing out the maxillary bone and originating from the ethmoid labyrinth. It is the most inferior ethmoid cell that is located infraorbitally nearest to the ostium of the maxillary sinus.

- **Onodi cell** (occurrence rate 3–51%): (named after Adolf Onodi, Hungarian rhinologicalanatomist, 1857–1919): most posterior ethmoid cell extending superiorly and laterally towards the sphenoid sinus (Fig. 8). Onodi cells may show an intimate relationship to the optic canal. Onodi cells are also known as sphenethmoid air cells.

- **Ethmomaxillary sinus** (occurrence rate 0.7–7%): posterior ethmoid cell expanding toward or even entering the maxillary sinus with drainage to the superior nasal meatus.

**Discussion**

This literature review presents an update of the clinical and radiological anatomy of the nasoethmoidal region. The latter includes the nasal cavities and the ethmoid bone. The ethmoid bone is a cuboidal structure that is located medial to the orbits above the nasal cavities and immediately inferior to the anterior cranial fossa. The nasal cavities are separated by a midline septum and contain each three nasal conchae (turbinates). A critical component of the nasoethmoidal region is the ostiomeatal complex. Disturbance of (para)nasal ventilation and drainage via the ostiomeatal complex may result in pansinusitis.

The prescribing clinician, taking and/or viewing CBCT images is challenged with interpreting the entire CBCT volume. The
anatomy of the nasal cavity is complex, in particular the ethmoid bone, and possess great variability with regard to form and structure. Basically, the nose is one of two gateways for air to enter the body when breathing (the other being the oral cavity). Olfaction is another major function of the nose. The cribriform plate of the ethmoid bone has multiple openings for olfactory nerve axons to reach the olfactory bulbs in the anterior cranial fossa.

With regard to CBCT imaging, the nasal floor, the inferior and middle conchae and the lower aspects of the nasal septum are frequently observed on CBCT scans of the maxilla. Larger FOVs (≥10 × 10 cm), especially when used for diagnosis and treatment planning of implant placement in the posterior maxilla or the use of sinus floor elevation procedures, will also depict the complex ethmoid bone with its multiple air cells and anatomical variants (Bornstein et al. 2017b; Jacobs et al. 2017a).

Understanding the complex anatomy and anatomical variations of the nasoethmoidal region is crucial for radiologic interpretation and diagnosis, especially from a clinical point of view (Gibelli et al. 2018). The precision and quality of current CBCT imaging greatly support the clinician in the assessment of these important anatomical structures, and to rule out para/nasal pathology.

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Conflict of interest
The authors declare that there are no conflicts of interest related to this review.

Zusammenfassung


Das Septum nasi (Nasenscheidewand) ist aus fünf Teilen zusammengesetzt: Lamina perpendicularis des Ethmoid, Vomer, Knorpelzepip, sowie Cresta nasalis des Os maxillae und des Os palatinum. In der Literatur wird über eine Gesamtfläche des Septums von etwa 25 cm² bis 33 cm² berichtet, je nach Geschlecht und Ethnie der Patienten. Das Knorpelzepip (Länge ca. 3 cm, Dicke 0,7 bis 3 mm) zeigt oft eine nach posteri gerichtete ländliche Fortsetzung zwischen Vomer und Ethmoid. Der Vomer bildet den unteren und hinteren Anteil der Nasenscheidewand und zieht bis zum Os sphenoidale hoch.

Die Nasenhöhlen werden durch drei paarige Nasenmuscheln in vier Etagen unterteilt, sodass die einströmende Luft über eine grosse Fläche erwärmt und befacht wird. Eine mechanische Reinigung der Atemluft erfolgt zudem durch die Vibrissae im Nasenvestibulum. Die grössere Nasenmuschel ist die Concha inferior, die als eigenständiger Knochen gilt. Diese Muschel erstreckt sich über die ganze Länge der Nasenhöhle (ca. 6 cm). Die mittlere und die obere Nasenmuschel gehören zum Ethmoid (Siebbein) und sind kürzer und kleiner als die untere Nasenmuschel. Alle Nasenmuscheln können radiologisch eine Pneumatisierung zeigen, am häufigsten die mittlere Muschel (Concha bullosa).

Die vier Nasengänge (Meati nasales inferior, media et superior sowie Recessus sphenoidalis) pro Seite haben diverse Öffnungen, in die sich anatomische Nachbarsstrukturen entleeren: im unteren Gang der Tränennasen (Ductus nasolacrimalis), im mittleren Gang die Kieferhöhle, die vorderen Siebbeinzellen sowie die Stirnhöhle und im oberen Gang die hinteren Siebbeinzellen. In der oberste Etage (Recessus sphenoidalis) mündet die Keilbeinhöhle (Sinus sphenoidalis). Der mittlere Nasengang wird auch als ostiomeataler Komplex bezeichnet wegen seiner komplizierten Verbindungen zu den diversen Nasennebenhöhlen.

Der Nasenboden besteht aus den gleichen Strukturen, die auch den harten Gaumen bilden: aus palatinalen Fortsätzen des Os maxillae sowie aus horizontalen Fortsätzen des Os palatinum. Das Dach der Nase bilden die paarigen Nasenknochen sowie die Lamina cribriformis des Ethmoid. Die seitlichen Nasenwände sind kompliziert aus mehreren Knochen zusammengesetzt: Os maxillae, Os frontale, Os lacrimale, Os palatinum sowie Os ethmoidale. Grössere Öffnungen in der lateralen Nasenwand sind der Hiatus semilunaris, u. a. mit dem Ostium maxillare, sowie das Foramen sphenopalatinum als Verbindung von der Nasenhöhle zur Fossa pterygopalatina.

Das Ethmoid (Os ethmoidale, Siebbein) ist ein sehr komplex gebautes Knochen und umfasst hauptsächlich die Siebbeinzellen (Labyrinth). Diese liegen medial zu den Augenhöhlen und drainieren zum mittleren und oberen Nasengang. Als anatomische Varianten gelten die Agger–nasi–Zelle (vorderste Siebbeinzelle), die Haller–Zelle (liegt infraorbital oberhalb des Ostium maxillare), sowie die Onodi–Zelle (hintere Siebbeinzelle mit enger Beziehung zum Canalis opticus).

Résumé
Le Cone Beam ou « image volumétrique par faisceau conique » est un outil de diagnostic de plus en plus commun dans la médecine dentaire moderne. Selon la taille choisie de la prise de vue, on visualisera des structures dépassant le complexe dento-alvéolaire - structures dont l’anatomie doit être connue pour un
Les cavités nasales subdivisées en quatre étages par les cornets communiquent avec d’autres structures anatomiques par différents canaux. Le conduit lacrymonasal débouche dans le méat inférieur. Le sinus maxillaire, les parties antérieures et moyennes du labyrinthe éthmoïdal ainsi que le sinus frontal s’ouvrent vers le méat moyen ; la partie postérieure du labyrinthe éthmoïdal vers le méat supérieur. Les sinus sphénoïdaux quant à eux communiquent avec l’étage supérieur des cavités nasales, les Recessus sphenoidales. Au vu des nombreuses relations avec les différents sinus, on utilisera aussi le terme de complexe ostiomeatal pour évoquer le méat moyen.

La paroi inférieure des cavités nasales est composée des mêmes éléments que le palais dur : le processus palatin du maxillaire ainsi que la lame horizontale du palatin. La paroi supérieure est composée par les deux Os nasale ainsi que par la lame criblée de l’éthmoïde. La paroi latérale quant à elle est complexe dans sa constitution : le maxillaire, le frontal, le lacrymal, le palatin et l’éthmoïde en font partie. Ses ouvertures les plus importantes sont le Hiatus semilunaris comprenant entre autres l’Osmaxillare ainsi que le Foramen spheno-palatinum (ouverture vers la fosse pterygoïdale).

L’éthmoïde est une structure osseuse particulièrement complexe dont la composante principale est le labyrinthe éthmoïdal. Situé en médial de l’orbite, ce dernier se déverse dans la cavité nasale à hauteur des méats moyen et supérieur. On évoquera les variantes anatomiques suivantes : la cellule d’Agger nasi (pneumatisation excessive d’une cellule éthmoïdale antérieure), la cellule de Haller (position infraorbitaire en dessous de l’Os maxillare) ainsi que la cellule d’Onodi (cellule la plus postérieure au contact du canal opaire).

References


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