CHAPTER 8

HEAD AND NECK

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Problems of the head and neck in the practice of plastic surgery include congenital, traumatic, infectious, neoplastic, and other conditions. A working knowledge of the anatomy of the head and neck is crucial in the diagnosis and surgical treatment of these diseases.

I. TRAUMATIC

A. Facial soft tissue injuries
   1. Stabilize patient and manage concomitant traumatic injuries (ABCDE, primary survey)
      a. Establish airway (may be obstructed by blood clots or damaged parts)
         i. Finger sweep / jaw thrust
         ii. Suction
         iii. Endotracheal intubation
         iv. Cricothyroidotomy or tracheotomy
      b. Control active bleeding by pressure, may need direct ligation in operating room or embolization in interventional radiology suite
   2. Palpate facial skeleton for underlying bone pain and instability; rule out injury to facial nerve, parotid duct, etc.
   3. Radiologic evaluation (Maxillofacial CT scan, C-spine CT, panorex)
   4. Tetanus and antibiotic prophylaxis
      a. Open fractures may require an antibiotic course
   5. Repair as soon as patient’s general condition allows with…
      a. Wounds closed preferably less than 8 hours post-injury, but primary closure may be delayed up to 24 hours
      b. Careful wound irrigation with physiologic solution
      c. Conservative debridement of nonviable tissue and foreign bodies
      d. Meticulous re-approximation of anatomy
      e. Definitive fracture fixation within 2 weeks (while fragments remain mobile)

B. Facial bone fractures
   1. Diagnoses
      a. Consider patient history/mechanism of injury
      b. Physical examination for asymmetry, bone mobility, diplopia, extraocular muscle entrapment, sensory loss, malocclusion, local pain
      c. Old (pre-injury) photographs often useful to assess baseline
      d. Imaging
i. Maxillofacial CT scan with thin slices (now imaging modality of choice)
ii. X-rays: Skull (Water’s view, rarely performed today) and cervical spine
iii. Panorex x-ray may be useful for mandible fractures (but maxillofacial CT usually adequate)

e. When dealing with panfacial fracture, stabilize articulating element (mandible), first by mandibulomaxillary fixation (MMF)
f. Once occlusion is aligned, work systematically, either “outside-in” (Gruss) or “inside-out” (Manson), establishing facial height, width, and projection by aligning key facial buttresses (open reduction) and plating of fractures (internal fixation)

2. Specific Fractures
   a. Frontal sinus
      i. Anterior and/or posterior table
      ii. May require Neurosurgery input for posterior table, monitor for CSF leak
      iii. Management depends on pattern, but may be nonoperative, ORIF, cranialization (removal of posterior table and allowing dura and brain to fill sinus) or obliteration (remove mucosa, fill with bone graft)
   b. Zygomatic complex (ZMC) and Orbit (Figure 1)
      i. ZMC and orbital floor (blow-out) fractures commonly associated
         (a) Eye exam: Extraocular movements to ensure no entrapment, visual acuity, globe injury
         (b) Periorbital ecchymosis often present
         (c) Ophthalmology consultation if suspicious of globe injury
      ii. Superior orbital fissure syndrome
         (a) Due to injury to contents of superior orbital fissure (CN III, IV, VI)
         (b) Ophthalmoplegia (CN III, IV, VI)
         (c) Proptosis
         (d) Ptosis (CN III)
         (e) Dilated pupil (CN III)
         (f) If also blindness (CN II), called orbital apex syndrome (surgery urgent)
      iii. Indications for surgery
         (a) Entrapment or cranial nerve impingement (emergency)
         (b) Enophthalmos
            (i) globe less projected because of increased intraorbital volume
            (ii) best seen from inferior/worm’s eye view
            (iii) usually require surgery if ≥ 2mm relative to unaffected eye
         (c) Hypoglobus: globe lower than opposite side because of decreased orbital floor support
         (d) Severe displacement creating facial asymmetry (sunken or overprojected cheekbone)
c. Nasal bone and Naso-orbital-ethmoidal (NOE)
   i. Nasal bone fracture most common facial fracture
      (a) Septal hematoma can cause septal necrosis; must be drained immediately
      (b) May be corrected by closed reduction/manipulation and placement of external splint and Doyle splints (internal)
   ii. NOE fractures can lead to telecanthus where the medial edge of the eyelid (canthus) moves away from midline (Figure 2)
      (a) May require ORIF to correct

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d. Maxilla
   i. Le Fort fractures (Figure 3)
(a) Disrupts vertical maxillary buttresses: major areas of structural stability
   (i) Zygomaticomaxillary
   (ii) Nasomaxillary
   (iii) Pterygomaxillary
(b) Treatment involves open reduction and internal fixation with miniplates to reestablish facial proportions and occlusion

Figure 3. LeFort Fractures

e. Mandible: often bilateral (ring concept), subcondylar most common (Figure 4)
   i. Clinical signs:
      (a) Malocclusion (“Does your bite feel normal?”)
      (b) Sensation of chin decreased due to mental nerve injury
   ii. Imaging
      (a) Maxillofacial CT scan
      (b) Panorex x-ray
      (c) C-spine imaging: 10-13% of mandible fractures coincide with c-spine fracture; maintain C-spine stabilization until absence of injury can be confirmed
   iii. Initial treatment
      (a) Liquid diet
      (b) Antibiotics and chlorhexidine mouthwash for open fracture (including fracture line involving dentition)
      (c) Re-establishment of normal occlusion is of primary importance
         (See Disorders of the Jaw below)
      (d) Use of interdental wiring (mandibulomaxillary fixation/MMF) in patients with teeth
(e) Use of patient’s dentures or fabricated temporary dentures in edentulous patient

(f) Depending on fracture location, (parasympysis, body, angle, ramus, subcondyle, condyle), open reduction and internal fixation (ORIF) with plates/screws may be indicated.

![Subregions of the mandible, and fracture of subregion fracture](image)

**II. INFECTIONS**

A. The head and neck are relatively resistant to infection due to their robust vascularity

B. Routes of spread
   1. Upper aerodigestive infections may track into the mediastinum
   2. Scalp and orbital infections may spread intracranially via the dural sinuses and ophthalmic veins

C. Types
   1. Facial cellulitis: mostly due to staphylococcus or streptococcus - may use a cephalosporin
   2. Oral cavity infections: mostly due to anaerobic streptococcus and bacteroides. Use extended spectrum penicillin or other anaerobic coverage (Augmentin/Unasyn)
   3. Acute sialadenitis: fever, pain, swelling over the involved parotid gland. Seen with dehydration, debilitation, diabetics, poor oral hygiene. Treat with antibiotics, fluids

f. Pediatric craniofacial fractures
   i. Usually more conservative with operative repair in this patient population, due to growing facial skeleton and developing dentition.
4. Atypical mycobacteria: seen in enlarged lymph nodes; drainage rarely required. Special cultures may be necessary.

5. NEOPLASTIC (exclusive of skin - see Chapter 7)

D. Primarily managed by Otolaryngologists but provide major reconstructive challenges for Plastic Surgeons (see next section)

E. Salivary gland tumors

1. Classification of tumors by location
   a. Parotid: most common (80%), most are benign (80%)
   b. Submandibular: 55% incidence of malignancy
   c. Minor salivary glands: least common, with highest incidence of malignancy (about 75%)

2. Diagnosis
   a. Primarily by physical examination
      i. Any mass in the pre-auricular region or at the angle of the jaw is a parotid tumor until proven otherwise
   b. Bimanual palpation: simultaneous intraoral and external palpation
   c. Signs more commonly seen with malignancy
      i. Fixed or hard mass
      ii. Pain
      iii. Loss or disturbance of facial nerve function
      iv. Cervical lymphadenopathy (metastases)

3. Treatment
   a. For benign tumors
      i. Surgical removal of gland with sparing of adjacent nerves, e.g. facial nerve with parotid; lingual and hypoglossal nerves with submandibular
   b. For malignant tumors
      i. Surgical removal of entire gland with sparing of nerve branches that are clearly not involved
      ii. Radiation therapy if tumor not completely removed
      iii. Cervical lymph node dissection with tumors prone to metastasize to nodes

4. Pathology
   a. Benign
      i. Pleomorphic adenoma: (benign mixed) high recurrence rate with local excision
      ii. Papillary cystadenoma lymphomatosum (Warthin's tumor): may be bilateral, (10%) male, age 40-70
   b. Malignant
i. Mucoepidermoid  
ii. Malignant mixed  
iii. Adenocarcinoma  

F. Tumors of oral cavity  
   1. Classification  
      a. Anatomical: malignancies behave differently according to anatomic site and prognosis worsens from anterior to posterior  
      b. Histopathologic  
         i. Benign: fibroma, osteoma, lipoma, cyst, etc.  
         ii. Malignant  
            (a) Most are squamous cell carcinoma or variants (may be related to HPV)  
            (b) Palate carcinomas are often of minor salivary gland origin  
            (c) Sarcomas in mandible, tongue, other sites are rare  
            (d) TNM staging is helpful for treatment planning and prognosis (i.e. tumor size, lymph node metastases, systemic metastases)  
   2. Diagnosis  
      a. Examination - including indirect laryngoscopy and nasopharyngeal endoscopy when indicated  
      b. Biopsy of any lesion unhealed in 2-4 weeks  
      c. X-rays and scans as indicated  
   3. Treatment  
      a. Surgical  
         i. Benign: simple excision  
         ii. Malignant  
            (a) Wide local excision with tumor-free margins with/without lymph node dissection  
            (b) Palliative resection may be indicated for comfort and hygiene  
            (c) Immediate reconstruction with vascularized flaps when indicated by size and location of defect (see next section)  
      b. Radiation therapy  
         i. Preoperative  
            (a) To increase chance for cure, especially with large lesions  
            (b) May make an inoperable lesion operable by shrinking it and reducing involvement with unresectable structures  
         ii. Postoperative  
            (a) If tumor-free margin is questionable  
            (b) For recurrence  
            (c) Prophylactic — controversial  
      c. Chemotherapy: usually for advanced disease
III. RECONSTRUCTION

A. General principles
   1. Goals
      a. Tension free closure of skin and soft tissue
      b. Maintenance of motor and sensory function
      c. Recreation of aesthetic contours
   2. Reconstructive ladder applied including…
      a. Primary closure (often best option if possible)
      b. Skin graft (full thickness for best color and quality match)
      c. Local flaps (often require two stages) and distant flaps
      d. Tissue expansion (longer term process)
      e. Free tissue transfer (lengthy procedures)

B. Scalp
   1. Main goal: protection of cranium/dura/brain
   2. Primary closure often possible, can be assisted with galeal relaxation incisions (scoring)
   3. Many rotation and advancement flap options
   4. Tissue expansion is an excellent option (can allow up to 50% reconstruction without obvious alopecia)

C. Eyelid
   1. Main goal: tension-free coverage of the globe to prevent exposure keratopathy and ectropion (chronic eyelid irritation)
   2. Defect size determines reconstruction options
      a. ≤30% can be closed primarily, performing lateral canthotomy and cantholysis can allow closure of defects up to 50%
      b. >50% requires local flap rearrangements, which often requiring two or more stages
         i. Many options including:
         ii. Cutler-Beard flap: pass tissue from below the lower lid under it and tack it into the upper lid defect
         iii. Mustarde flap: swing tissue from the malar area to the lower lid
   
D. Nose
   1. Main goal: Create aesthetic piriform aperture coverage and maintain airway patency and nasal lining
   2. Divided into 9 subunits: single dorsum, tip, columella, and paired sidewalls, soft triangles, and alar lobules (Figure 5)
   3. Often complicated by need for cartilaginous support
   4. Numerous local flap options including…
a. Bilobed flap: for defects up to 1.5cm, Y-shaped tissue pivoted to fill defect and one donor site, with the other donor closed primarily
b. Nasolabial flap: tissue from along the cheek-nose junction swung into defect on the nasal ala or sidewall
c. Forehead flap: workhorse two-staged technique where tissue from the central forehead is swung down to reconstruct part or all of the nose

Figure 5. Nasal Subunits

E. Ear
1. Main goals: Primarily aesthetic reconstruction (symmetry important)
2. Many distinct components with specific reconstruction options for each, mostly involving local rotational flaps when primary closure is not an option
3. Often require cartilage from the other ear or rib
4. Total reconstruction: tissue expansion of nearby skin, and then advancement overlying a cartilage graft construct based on the contralateral ear
5. One of the few facial structures where a prosthesis is a good option

F. Lip
1. Main goal: Recreate oral competence and speech with a sensate aesthetic construct
2. Distinct coloration and contour makes local flaps preferred options
3. Perfect alignment of incisions key, or otherwise can be very noticeable
4. Rule of thirds for defects
   a. ≤1/3rd: Primary closure
   b. ≤2/3rds: local flaps
      i. Abbé Lip Switch flap: two-stage, section of lip swung to fill defect in opposite lip
ii. Estlander flap: lateral end of lip swung up to end of opposite lip
c. ≥2/3rds: Karapandzic flap -- circumoral incision to mobilize lip and cheek, may narrow oral opening (microstomia) (Figure 6)

Figure 6. Karapandzic flap illustrating circumoral incision to mobilize lip and cheek

G. Mandible
1. Main goal: restore speech and mastication
2. Size of defect key
   a. <6cm: avascular bone grafts can work, if adequate soft tissue present
   b. >6cm: vascularized bone graft (free flap)
      i. Fibula osteocutaneous flap: workhorse, can be shaped into an entire mandible and can also provide skin and soft tissue for floor of mouth or tongue reconstruction
      ii. Also can use: scapular flap, iliac crest flap
   c. Metal reconstruction plates are an option for patients who cannot tolerate a free flap operation but extrusion through the tissue is a common problem

H. Tongue, floor of mouth, and pharynx
1. Main goals: prevent salivary contact with neck structures, restore swallowing and speech
2. Can use skin grafts for small posterior pharyngeal defects
3. Partial tongue resection can be closed primarily
4. Pectoralis pedicled flap is very reliable for floor of mouth and pharynx
5. Free flap: free radial forearm, anterolateral thigh (ALT) can be tubularized

IV. MISCELLANEOUS

A. Disorders of the jaw
   1. Deformities of the mandible
      a. Classification
         i. Retrognathia: mandibular retrusion with respect to maxilla
ii. Prognathia: mandibular protrusion with respect to maxilla
iii. Micrognathia: underdeveloped, retruded mandible
iv. Open bite: teeth cannot be brought into opposition
v. Crossbite: lower teeth lateral to upper teeth
vi. Micro- and microgenia: under or overdevelopment of chin
vii. Normal occlusion: “mesiobuccal cusp of the maxillary first molar aligns with the buccal groove of the mandibular first molar”

b. Diagnosis
i. Physical examination
ii. X-rays, including a cephalogram (lateral x-ray at a fixed distance) to measure relationships of skull, maxilla and mandible
iii. Dental casts are made (usually by an orthodontist) and “model” or mock surgery is performed on the casts to determine degree of advancement/setback of bone.

c. Treatment
i. Establishment of normal or near normal occlusion of primary importance
ii. Use of osteotomies with repositioning of bone segments, bone grafts as needed, with or without orthodontic corrective measures as needed
iii. Mandibular distraction for severe discrepancies

2. Deformities of the maxilla
a. Most commonly, retrusions or underdevelopment, “dish-face”
b. Must also examine the vertical height of the midface (vertical maxillary excess, VME versus vertical maxillary deficiency, VMD)
c. Diagnosis - as for lower jaw
d. Treatment - as for lower jaw

3. Temporomandibular joint disorder
a. Etiology: previous trauma, arthritis, bone overgrowth, bruxism, tumors
b. Symptoms: pain, crepitus, joint noises, limited opening, occlusion change
c. Diagnosis
i. Consider patient history
ii. Examination: auscultation, opening, occlusion
iii. Imaging
   (a) Tomograms, arthrogram/arthroscopy, MRI
d. Treatment
i. Conservative: joint rest, analgesics, bite plate, etc.
ii. Surgery: seldom indicated

B. Facial paralysis
1. Effects:
   a. Very significant asymmetry, deformity of the face, drooling, exposure of the cornea
b. Deformity is accentuated by muscle activity of normal side (if unilateral)

2. Etiology
   a. Congenital
   b. Traumatic
   c. Infectious
   d. Tumor
   e. Vascular (intracranial)
   f. Idiopathic (Bell’s palsy)

3. Diagnosis
   a. Demonstrated by asking patient to raise eyebrow, smile, etc.

4. Treatment includes:
   a. Correct known etiology or supportive (for most Bell’s palsies)
   b. Protect cornea by taping lids, lid adhesions: ophthalmology consultation is critical
   c. Re-establishment of nerve function by primary nerve repair or nerve graft (sural nerve common donor nerve)
      i. Can be done cross-facially by rerouting motor axons from unaffected side but takes months to see improvement and denervated muscles may become unsalvageable
   d. Other measures, such as muscle transfers, static suspension, skin resections, free tissue transfers of muscle, etc.
      i. Free gracilis muscle flap to recreate smile with cross-facial nerve graft or adjacent nerve to masseter innervation (CN V)

REFERENCES

