**Tessier Clefts**
By Patricia Bacon Smith

**Introduction**
I’ve compiled this information about Tessier clefts to help concerned family members and individuals better understand these conditions. I’ve interchanged anatomical language with lay terms throughout and have reworked Dr. Tessier’s original diagrams. They are displayed here with permission of the publisher. Any errors or omissions are mine.

**Keep in mind that Dr. Tessier’s classification system describes the various clefts in the face, but his system does not explain why or how these clefts occur. I invite researchers to fill in that piece of the puzzle.**

**What is a cleft?**
A cleft is a gap in the soft tissue, bone, or both. Many people think of cleft lip or cleft palate as examples, and these types of clefts are by far the most common. However, some people’s clefts involve not only the mouth and nose, but also the rest of the face. A facial cleft may involve a split in the bones and skin (fissure) or a misshapen facial feature (dysplasia).

**What is a Tessier cleft?**
Clefts may involve the mouth, cheeks, eyes, ears and forehead and may continue into the hairline. These craniofacial clefts are often referred to as Tessier clefts. They are numbered from 0-14 to indicate the location and extent of the cleft using the mouth, nose and eye sockets as landmarks, with the midline designated 0. These more extensive conditions may also be described anatomically, such as “oro-ocular cleft” and “fronto-nasal dysplasia.”

**Who is Tessier?**
Dr. Paul Tessier (pronounced Tess ee ay) published his definitive text on craniofacial clefts in 1976. His work brought descriptive order to complex facial clefts: a way “to identify the consistent, anatomic pathways of soft tissue and skeletal clefts.” (David, 1989) Dr. Tessier also demonstrated that the area around the eyes could be safely reconstructed, using an intracranial approach. Previously, the orbits were thought to be too delicate to withstand surgery.

**Synopsis of Dr. Tessier’s ideas:**
Cleft is diagnosed when there is any interruption of either soft tissue (hair line, eyebrows, eyelids, nostrils, lips or ears) or skeleton. Clefts occur in well-defined places and along definite axes. They may be evaluated by their relationship to two main functional systems: the mouth and the eyes.

A soft tissue cleft corresponds with a skeletal cleft and conversely. **

**Later writers indicate that this is not always true.**
Bone and soft tissue are rarely involved to the same extent. From the midline to the infra orbital foramen, soft tissues defects are more frequent (or more destructive) than those of the skeleton. From the infra orbital foramen to the temporal bone, skeletal defects are more severe than soft tissue clefts, except for ear deformities.

Clefts occur in well-defined places. Description of clefts based on skeleton (rather than soft tissue) is easier because of the constancy of most skeletal points.

Clefts are not seen along the course of a main vessel. Clefts in the skeleton do not imply absence of principal vessels or nerves in the area.

Clefts are situated along definite axes. Clefts of the upper lip, eyebrow, and frontal bone are often along the same axis as that of clefts of the cheek and lip.

The cleft lip condition is encountered in clefts number 1, 2 and 3**

**Tessier clefts of the lip are, in fact, anatomically distinct from classical cleft lip.

Clefts may be evaluated by their relationship with two main functional systems: either the lip and upper jaw, or the eyelids and orbital cavity.

To orient, the orbit is described as two hemispheres: clefts running north through the upper lid are cranial; clefts running south through the lower lid are facial.
What else do I need to know?
Some knowledge of head and face anatomy will be helpful. I’ve included a simple sketch of the bones of the head and face in the diagrams. Here are some terms that you will encounter:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Ala or alar</td>
<td>The part of the nostril that flares</td>
</tr>
<tr>
<td>Anterior</td>
<td>Toward the front of the body</td>
</tr>
<tr>
<td>Canthus</td>
<td>The corner of the eyelids</td>
</tr>
<tr>
<td>Ethmoid bone</td>
<td>The bone between the eyes; forms upper part of nasal septum, sidewalls of eye socket</td>
</tr>
<tr>
<td>Frontal bone</td>
<td>Forehead, including brow and top of eye socket</td>
</tr>
<tr>
<td>Glabella</td>
<td>The bony part between the eyebrows</td>
</tr>
<tr>
<td>Globe</td>
<td>Eyeball</td>
</tr>
<tr>
<td>Infraorbital foramen</td>
<td>Just below the orbit, a channel through bone, a conduit for nerves and vessels to pass through.</td>
</tr>
<tr>
<td>Lacrimal bone</td>
<td>Small thin bone between nasal cavity and eye socket. Contains groove for tear duct.</td>
</tr>
<tr>
<td>Lateral</td>
<td>Away from the midline of the body</td>
</tr>
<tr>
<td>Malar</td>
<td>The cheekbone just below the eyes</td>
</tr>
<tr>
<td>Mandible</td>
<td>The lower jaw</td>
</tr>
<tr>
<td>Maxilla</td>
<td>The bone that forms the upper jaw</td>
</tr>
<tr>
<td>Medial</td>
<td>Toward the midline of the body</td>
</tr>
<tr>
<td>Nasal bone</td>
<td>The bridge of the nose</td>
</tr>
<tr>
<td>Orbit</td>
<td>Eye socket (made up of six bones)</td>
</tr>
<tr>
<td>Perpendicular plate of ethmoid</td>
<td>Upper part of nasal septum</td>
</tr>
<tr>
<td>Posterior</td>
<td>Toward the back of the body</td>
</tr>
<tr>
<td>Soft tissue</td>
<td>The skin, muscle and other tissue; not bone or cartilage</td>
</tr>
<tr>
<td>Sphenoid bone</td>
<td>The central part of the cranial floor. Forms part of the floor and sidewalls of eye socket.</td>
</tr>
<tr>
<td>Supra orbital foramen</td>
<td>Channel above eye socket for nerves and vessels</td>
</tr>
<tr>
<td>Tarsal plate</td>
<td>Cartilage type material along the edge of the eyelid</td>
</tr>
<tr>
<td>Vermillion</td>
<td>Pink/purple lip tissue</td>
</tr>
<tr>
<td>Vomer</td>
<td>Back and bottom part of nasal septum. Looks like an upside down T, but think of the top of the T running back to front rather than side-to-side.</td>
</tr>
<tr>
<td>Zygomatic arch</td>
<td>The cheekbone that connects to the temple, a continuation of the malar bone</td>
</tr>
</tbody>
</table>
Diagrams of Tessier clefts
The following excerpts are from Tessier, P MD, “Classification of rare craniofacial clefts”, Journal of Maxillofacial Surgery, 1976, Volume 4, pages 69-92: figures 1a, 1b, by permission of the publisher, Churchill Livingstone.

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<table>
<thead>
<tr>
<th>Soft tissue clefts of the face, numbers 0 – 14,</th>
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<tr>
<th>Bony clefts of the face, # 0 – 14,</th>
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Fig. 1b  Boney Clefts of the Face
The following diagram shows the bones of the face. Use it to understand the following diagrams of Tessier clefts.
Bony or skeletal clefts

#13 and #1:
on the cranium comes through frontal bone (forehead)
through olfactory groove (sense of smell)
between nasal bone (bridge of the nose)
and frontal process of maxilla (upper jaw)

An example of #13 is an encephalocele.

#12 and #2:
through lateral mass of ethmoid (the bone
between the eyes)
across premaxilla (front, center of upper gum).

#2 appears to split the tooth

Soft Tissue Clefts

#1: through the dome of the nostril
cartilage, occasionally through the lip

#2: slightly to the outer (lateral)
curve of the nostril (ala) and into
the lip

#12: cranial cleft between nasal
bridge and inner corner of eye
(medial canthus), coloboma (notch)
of the root of the eyebrow

#13: cranial counterpart of #1;
medial (toward the middle of the
face) to the eyebrow
Bony clefts #11 and #3:

#11: upper medial orbital cleft, cranial counterpart of #3

#3 runs from inside (medial) lower edge of orbit (eye socket) through lacrimal bone (tear duct apparatus) across maxilla (upper jaw) and alveolus (gum ridge) to lateral central incisor

#10 and #4:

#10 is an upper central orbit cleft, extends to roof of eye socket and forehead; the cranial extension of #4

#4 is a central orbito-maxillary (eyesocket - upper jaw) cleft through infra orbital rim (upper edge of eye socket), orbital floor, and medial to infra-orbital nerve through maxillary sinus to alveolus (gum ridge)

Soft Tissue Clefts

#11 and #3:

#11: notch of upper lid and eyebrow

#3: through the lacrimal punctum (tear duct) around the nostril and into the lip at the cupid’s bow

#10 and #4:

#10 notch of the upper lid, divides the eyebrow

#4: lateral to the tear duct, across the cheek, skirting the nose, to the lip between the cupid’s bow and corner of mouth
Bony Clefts #9 and #5

#9: upper lateral orbital cleft; seems to correspond with #5

#5: runs through the infra orbital rim (lower rim of eye socket), orbital floor and maxilla (upper jaw bone) lateral to the infraorbital nerve and maxillary sinus; proceeds to alveolus (gum ridge) behind canine tooth in premolar region.

Soft Tissue Clefts #9 and #5:

#9: upper lateral orbital cleft in the outer third of upper eyelid

#5: lateral orbito-maxillary cleft through the outer third of lower lid through cheek to lip near outer corner of mouth
Numbers 6, 7 and 8 belong together and comprise the Treacher Collins Franceschetti complex, and are also seen in Goldenhar syndrome.

#6: maxillary zygomatic cleft opens into infra orbital fissure (eye opening), travels through back of upper jaw with high palate and choanal atresia (abense of inner ear structure)

#7: temporoorbital cleft with absence of zygomatic arch, deformities of mandibular ramus, condyle and coronoid process

#8: frontozygomatic cleft which appears to be cranial counterpart of #6.

Numbers 6, 7 and 8 belong together and comprise the Treacher Collins Franceschetti complex, and are also seen in Goldenhar syndrome.

#6: lower lid coloboma (notch) with a marked furrow across cheek

#7: presents as macrostomia (wide mouth) and pre-auricular (ear) tags

#8: true cleft of lateral canthus (outer corner of eye) associated with Goldenhar Syndrome
Tessier Facial Clefts  Selected Bibliography


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