Vocal Fold Congenital Lesions Anatomo-Pathology and Phonosurgery

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Looking at the literature, we see that the first descriptions of cystic laryngeal lesions date from the early twentieth century and that the notion of "sulcus glottidis" is even earlier, based upon autopsy findings. However, a certain confusion prevailed between laryngeal cysts in general and vocal fold cysts in particular. Furthermore, the distinction failed to be made between the often described mucus retention cysts and the in fact more prevalent epidermal cysts.

It was Ash and Raum in 1956, followed by Kleinsasser in 1968 and De Santo in 1970 who brought about a beginning of a classification of the various lesions. G.Cournut and my contribution to this particular field of benign vocal fold pathology was probably helped along by the conjunction of two factors (Table 1) : First, an improved diagnosis of these congenital lesions through the recognition of their acoustic characteristics and -even more so- the stroboscopic signs which almost always make it possible to confirm or at the very least strongly to suspect such a lesion. Secondly, the development of suspension micro-laryngoscopy with a frontal lens

of 350 mm instead of the usual 400 mm, and 1.6-fold magnification. The image thus obtained is much bigger, and it is certain that this enable to see lesions which had previously gone unnoticed. It has further enabled to perform micro-surgery of the utmost precision under optimal conditions, being much closer up to the vocal folds.

The congenital lesions in question are five in number (Table 2) : anterior commissure micro-web, epidermal cyst, sulcus glottidis, vergeture and mucosal bridge.

Before describing them, let me place them in our experience, strictly limited as it is to benign lesions of the vocal folds, excepting the treatment of other, notably dysplastic or degenerative, lesions. The statistic (Table 3) covering 28 years' work show that, out of 3711 interventions on 3400 patients, nodular lesions, with 1078 cases, are the most frequent at 31.7%, followed by congenital lesions at 28%. I would also like to stress the relatively large number of cases of post-surgical scarring requiring surgery: 153 patients. These scars have two origins: either excessive surgery which has damage the vocal ligament or else an undetected, generally congenital, lesion, the two being often associated. Such iatrogenic pathology is becoming more and more frequent and our young colleagues should be alerted to the serious functional dangers to which they can expose their patients and which are often difficult to correct. Over the last 12 years, congenital lesions have become the most frequent at 32.6% ahead of nodular lesions. This mainly reflects the fact that we are now better able to diagnose congenital lesions which generally used to go undetected as causes of dysphonia.

Among the 293 children I have operated on (Table 4), most of them are boys, particularly because of nodular lesions. Even so, it is interesting to note that congenital lesions are found in 45.4% of cases.

Table 1 Diagnostic Tools

· Acoustic characteristics
· Stroboscopic signs (local rigidity)
· Suspension Micro-Laryngoscopy frontal lens=350mm magnification=×1.6

Table 2 Congenital Vocal Fold Lesions

* Anterior commissure micro-web
* Epidermal cyst
* Sulcus glottidis
* Vergetures
* Mucosal bridge

Table 3 Statistics : 1970~1998

PATHOLOGY	NB OF PATIENTS	INTERV. IN 2 STAGES	RECURRENCES	NB OF INTERV.
Nodular lesion	1078		35	1113
-nodules	648		25	673
-pseudo-cysts	210		8	218
-fus.muc.thickenings	220		2	222
Polyps	444		8	452
Mucous cysts	139		3	142
Epidermal cysts	633	150	18	801
Sulcus-vergetures	317	62	4	383
Dilated capillaryies	68		4	72
Granuloma	17		2	19
Reinke's edema	204	1	3	208
Cancer	42			42
Recurrent N. Paralysis	82		6	88
-teflon	30			30
-fat	29		3	32
-collagen	23		3	26
Chronic laryngitis	100		1	101
Scars	153			153
Papilloma	39		7	46
Various	84	1	6	91
TOTAL	3400	214	97	3711

Table 4 Statistics in Children (1970~1998)

PATHOLOGY	MALES	FEMALES	TOTAL
Nodules	69	29	98
Fus. muc. thickening	18	4	22
Pseudo-cysts	14	8	22
Polyps	4	1	5
Mucous cysts	5	6	11
Epidermal cysts	75	50	125
Sulcus-vergetures	4	4	8
Papilloma	1	1	2
TOTAL	190	103	293

Nodular lesions: 142=48.5%
 Congenital lesions: 133=45.4%

Table 5 Statistics in Singers

LESIONS OPERATED ON SINGERS : 1970~1998	
Nodular lesions	97
-nodules	50
-pseudo-cysts	26
-fus. muc. thickenings	21
Polyps	21
Dilated capillaries	9
Mucous cysts	4
Chronic laryngitis	3
Epidermal cysts	48
Sulcus-vergetures	19
TOTAL	201

Congenital lesions=33.3%

In children it is often difficult to distinguish between nodular and congenital lesions, such as epidermal cysts, and this uncertainty often motivates the indication of surgery but never before 9 or 10 years old.

Concerning 201 singers who have been operated on (Table 5), here again, nodular lesions, generally very small, are the most frequent. But congenital lesions with 67 cases (33.3%) are not unusual. This leads us to think that this kind of congenital lesion may be compensated for a long time by such

professionals, but that very cautious micro-surgery may in some cases be indicated.

Before going further into how such lesions are treated, a question arises: **why should we call them "congenital"?** Etio-pathogenic opinion on this score is deeply divided. As far as anterior commissure microwebs are concerned, there is no doubt at all. In contrast, various theories have been put forward regarding epidermal cysts, sulci, vergetures and mucosal bridges. The oldest of these theories is that of post-infectious origin for vergetures. And this hy-

pothesis cannot be entirely ruled out in certain cases. A traumatic origin is the theory most often set against that of congenital origin for these lesions: epidermic inclusions following vocal abuse linked micro-traumas. While it cannot be entirely dismissed, this theory does not stand up against the arguments in favor of a congenital origin:

- *the very frequent bilateral aspect,
- *possible association of all these types of lesions on one or both vocal folds
- *their presence found in children
- *evolution observed over a number of years from one lesion to another
- *generally long-standing dysphonia dating back to childhood.
- *familial sequences

Surgical treatment is a logical consequence of perfect understanding of these LESIONS' ANATOMO-PATHOLOGY

Vocal fold anterior commissure microweb (Fig. 1)

The more usual aspect is that of a fine mucosal web on the upper side of the vocal folds, straddling the anterior laryngeal commissure. Dilated anterior commissure capillaries associated with simple nodules give the hint and when the two folds are parted with microforceps, the microweb is disclosed.

Any vocal fold malformation, congenital or acquired, can be associated with microwebbing but nodules are far the most frequent. There is undoubtedly a link between the appearance of certain nodules and the microweb: 21% of associated microwebs among the cases of nodular formations I have operated on.

Epidermal cyst

The definition of the epidermal cyst is highly histopathological (Fig. 2): it is formed of a true malpighian wall growing centripetally and of squamous debris within. It is important to distinguish between epidermal cysts, which are congenital lesions, and other acquired lesions:

-serous pseudocyst (Fig. 3) is not a true cyst: his wall is formed by the distended vocal fold covering epithelium,

-differential diagnosis is more difficult with mucus retention cyst (Fig. 4):

here is a true cyst, formed by a very fine wall of two layers of respiratory-type cells, filled with mucous; but this is a non-congenital lesion, acquired by obstruction of a mucous gland

Fig. 1 Anterior commissure microweb associated with vocal fold nodules.

Fig. 2 Histopathological cross-section of a vocal fold epidermal cyst.

Fig. 3 Serous pseudocyst in the right vocal fold.

Fig. 5 "Bamboo node" (rhumatoid lesion).

Fig. 4 Mucous retention cyst in the left vocal fold.

duct.

-another submucosal lesion which has attracted our attention for a number of years was initially described as "rhumatoid nodules" (Fig. 5), arising as it did in relation to auto-immune diseases, and to lupus erythematosus in particular. This lesion is most often bilateral. It is composed of non-specific fibrous deposits which have infiltrated the vocal ligament, which account for the rigidity of the vocal folds and the severe consequent dysphonia. The lesion presents an aspect falsely reminiscent of a cyst and Japanese authors reporting few cases recently, very suggestively named it "bamboo node" (Fig. 5). Cleaning out the ligamentary infiltration after cordotomy and associated cortico-therapy enable the lesion to be cured in most of the eleven cases we have met with.

Different aspects of epidermal cysts:

- sometimes they are obvious with a pearly white aspect (Fig. 6)
- some diagnosis are less obvious with vocal folds inflamed and somewhat swollen: explora-

Fig. 6 Epidermal cyst in the left vocal fold.

Fig. 8 Opening of a right vocal fold epidermal cyst after its removal by cordotomy

Fig. 7 Exposure of a left vocal fold epidermal cyst after cordotomy.

tory cordotomy is what brings the cyst to light (Fig. 7)

-epidermal cysts may open through tiny holes in the mucosa (Fig. 8). Pressing an instrument against the upper side of the vocal fold, where the dilated capillaries arrive, forces out the characteristic thick pearly-white liquid of an epidermal cyst. Such a tiny hole can be blocked, in which case the cyst fills up again. It swells and the inner pressure opens the orifice and the cyst empties. This can explain the variable aspects at a few days interval in one and the same patient, and also how the voice can suddenly improve. Such fluctuations in the voice correlate with the vocal fold examinations findings.

-in 46% of the cases on our records, cysts are bilateral.

Mucosal bridges (Fig. 9)

Histologically, a mucosal bridge is formed from junctional and subepithelium tissue surrounded by squamous epithelium like that of the vocal fold cover proper.

-Usually, it is identified by stretching with

Fig. 9 Right vocal fold mucosal bridge stretched by a curved microforceps

Fig. 11 Histopathological cross-section of a sulcus glottidis

Fig. 10 Left vocal fold sulcus opened by a curved microforceps stretching his inferior edge

microforceps.

-They are always associated with other congenital lesion such as sulcus or vergeture.

-Some mucosal bridges can be very wide and thick. This causes surgical problems, as simple excision leaves a notched scar.

Sulcus glottidis and vergetures (Fig. 10, 11, 12, 13)

The histologic cross-section of a sulcus shows its thick wall represented by a pluristratified malpighian epithelium with epidermal desquamations at the bottom of the sac. We interpret a sulcus sac as being of epidermal cyst origin, where the cyst has ruptured through the mucosa, leaving a persistent widely open track.

Two figures (Fig. 14, 15) clarify the idea of a sulcus and of a vergeture.

Fig. 14 : "sulcus" means furrow. A furrow may be deep and narrow, as above or wide and shallow, as below. It is only the aspect shown above which we designate "sulcus" and it corresponds to an opened intra-cordal epidermal cyst. It is thick walled, the base of the sac adheres to or may penetrate the cordal ligament and is filled with epidermal

Fig. 12 Bilateral vergeture

Fig. 13 Left vocal fold vergeture under magnification

SULCUS GLOTTIDIS

Fig. 14 Difference between sulcus and vergeture

desquamations (Fig. 14 above). On the other hand, the aspect shown below is quite different and we call that a “*vergeture*” (Fig. 14 below). Here the cover of the vocal fold is markedly atrophic, the superficial layer of the lamina propria has gone, leaving the mucosa closely adherent to the fibers of the vocal ligament. The ligament fibers too may be desiccated, resulting in direct adhesion to the muscle fibers. The lower edge of these vergetures are always prominent, stretched like bow-strings by cordal ligament fibers. When bilateral, this gives rise to the “ovular glottic” aspect.

Fig. 15 shows from top to bottom and left to right how the evolution of an intracordal epidermal cyst, opening onto the mucosa, results in a sulcus, probably by way of mechanical phenomena. When the cyst opening is not single but double a mucosal strip, which we call a “*mucosal bridge*”, is isolated as seen at the bottom right.

This personal view does seem to be supported by findings at operation and subsequent histopathology reports.

ENDOLARYNGEAL MICROSURGICAL TREATMENT

Cysts all develop in the submucosal chorion and

INTRA-CORDAL EPIDERMAL CYST EVOLUTIONS

Fig. 15 Evolution of epidermal cyst to sulcus and mucosal bridge

often infiltrate the vocal ligament fibers more or less deeply, making dissection difficult, particularly in children whose lamina propria has not yet attained his final structure. For this reason, I prefer to perform such delicate dissection with classical cold instrumentation rather than with a CO₂ laser. The interventions are carried out under general anesthesia with endotracheal intubation which gives:

- *good exposure
- *vocal folds immobility
- *duration
- *safety

Surgical actions must absolutely respect 3 basic principles:

- *maximum conservation of healthy mucosa
- *non-damage the vocal ligament
- *preservation of healthy anterior commissure mucosa as to avoid iatrogenic synechia.

Microweb

The two folds are spread apart using the vocal fold retractor. The microweb thus exposed is sectioned by straight upward microscissors. Some adrenaline swabbing ensures haemostasis. Such careful sectioning should only be performed if:

Epidermoid cyst

Fig. 16 Endolaryngeal microsurgical technique for epidermal vocal fold cyst treatment

-the larynx is wide enough (thus, not in children)

-the microweb is large enough

-the microweb is parallel to the superior surface of the fold.

Subglottal anterior commissure mucosal webs are not to be sectioned, as they never fail to recur.

Epidermal cyst (Fig. 16)

-A mucosal incision (cordotomy) is made with a sharpened lancetknife on the superior surface of the vocal fold over the lesion, parallel to the free edge, slightly longer than the diameter of the cyst itself.

-He is then isolated with a blunt dissector. First, the cystic membrane is separated from the covering epithelium. It is more delicate to separate the cyst from the vocal ligament into which it can be deeply embedded with inflammatory adhesences.

Sulcus Glottidis

Fig. 17 Endolaryngeal microsurgical technique for sulcus glottidis treatment

-The removal of the cystic pocket intact guarantees against recurrence.

-The site is checked over so as to avoid overlooking any second deeper cyst.

-One often finds a small cystic opening onto the mucosa under the free edge.

-An intracordal hydrocortisone injection is given before approximating the mucosa edge-to-edge without loss of substance and holding it in place with fibrin glue.

Sulcus glottidis (Fig. 17)

For a sulcus glottidis (=open epidermal cyst), it is important not to over-resect, for fear of causing a secondary scar notching.

-We therefore use a very sharp lancet knife to painstakingly incise the superior and inferior ridges circumscribing the opening of the epidermal pocket which has been enlarged by stretching the lower edge with a fine curved microforceps.

-Then, working from these incisions with a blunt curved dissector, we free the covering mucosa right

down to the bottom of the sulcus sac and it is more difficult, particularly in children, to separate the sulcus sac from the vocal ligament fibers which one wishes to preserve as much as possible.

-The sulcus sac can then be removed intact after sectioning the remaining anterior and posterior attachments using curved microscissors.

-The subglottal mucosa is loosened along a few millimeters, enough to be able to approximate the superior and inferior margins without traction and loss of tissue. Fibrin glue helps to keep the mucosa back in place, edge - to - edge.

Mucosal bridges

They are always associated with a sulcus glottidis or a vergeture.

We cut with curved microscissors there anterior and posterior attachments.

Vergetures (Fig. 18)

It is the most difficult case of congenital lesion to treat. The significant dysphonia following such a

Vergetures

Fig. 18 Endolaryngeal microsurgical technique for vocal fold vergetures treatment

lesion, which is nearly always bilateral, has two basic causes:

-a *cordal rigidity* which is very clear on stroboscopy, caused by close adherence of the atrophic mucosa to the vocal ligament.

-and *glottal air loss on phonation*, due to the ovular glottic aspect.

From these two causes, the microsurgical technique follows logically:

-*freeing the mucosa* from the ligament fibers, so as to recover a certain suppleness. This is very tricky and must be performed with the lancet knife to preserve as much as possible the very atrophic and fragile mucosa.

-and to reduce the glottal air-loss, we practice an

intracordal autologous fat injection.

These two operations may be performed most often in a single surgical step or else in two.

This protocol equally holds for treating certain kinds of scarring.

CONCLUSION

Vocal fold congenital lesions are a non-exceptional cause of dysphonia. They need to be recognized and diagnosed. To improve the voice, the only treatment is surgical completed by speech therapy. Endolaryngeal microsurgery is one of the means employed in phonosurgery. It is in contrast development and still has a fine future before it.

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