Laryngeal intubation granuloma

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Laryngeal granulomas following endotracheal anaesthesia are rare, considering the large number of cases undergoing this procedure. The complaint of the patient will appear usually some time after the operation, so much so that the patient may not mention the history until he is asked about it when the condition is suspected by the laryngologist.

Review of literature

The first case recorded in literature was by Clausen (1933). He reported a case of a small granuloma which appeared on the posterior end of the larynx below the right vocal cord, this occurred in a young lady who had undergone dental extraction with endotracheal anaesthesia five months prior to the complaint.

The second case reported by Gould (1935) was in a young lady undergoing hysterectomy under endotracheal anaesthesia. She complained of loss of voice immediately after the operation, with attacks of choking on and off till she sought advice four months after the operation where a granuloma was removed from the lower surface of the left cord.

The third case was recorded by Cohen (1938) of a right-sided granuloma developing in a 49-year-old lady two months after a cholecystectomy done under endotracheal anaesthesia by the blind nasal route after repeated attempts.

Since then solitary cases have been reported by Smiley (1940); Farrier (1942); Robin (1946); Kearney (1946); Tuft (1947); McLauren (1947); Lewis (1947) two cases; Barton (1947) two cases; Finer (1948); Hill (1948); El Mofty (1949) two cases; Watless (1949); New (1949) reported nine cases; El Samma (1950) two cases; MacNeil (1951) and Wright (1951) each reported one case; Baron (1951) reported seven cases; Peiner (1951) described four cases. In 1952 Brown and Leiberman reported one case each. In 1953, Heller, Kamsler and Joannovich reported one case each and Matzker reported two cases. In 1954 Melick reported one case. In 1957 Epstein reported ten cases, and in 1965 Mossad reported six cases.

Case records

Seventeen new cases are reported from the Ear, Nose and Throat Department, Ain Shams University Hospital, seen and studied by the authors during the last six years.

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Discussion

Sex

In our cases, out of seventeen cases, fourteen were females while only three cases were males, a ratio of about 5:1. In all the previously recorded cases the total number of female cases much exceeded the males. In Epstein's collection from the literature, of 54 cases, 42 were females and only 12 were males, and in his own 10 cases, 7 were females and 3 were males. A cause for the prevalence of the females could not be found; the relative small size of the larynx is not a cause as the condition is never seen in children who have a relatively and actually smaller larynx.

TABLE I.

Case No.	Age (yr.)	Sex	Complaint			Onset of complaint after op.	Nature of operation	Site	
			H′	C″	D‴			Rt.	Lt.
1	30	F	+	+	—	6 months	caesarian	+	—
2	22	F	+	—	—	2 months	caesarian	+	—
3	32	F	+	—	—	3 months	caesarian	+	—
4	35	F	+	—	—	3 months	caesarian	+	—
5	35	F	+	+	—	2 months	appendicectomy	—	+
6	38	F	+	—	—	2 months	caesarian	+	—
7	32	F	+	—	—	5 months	tonsillectomy	+	+
8	18	M	+	—	—	2 months	appendicectomy	+	—
9	30	F	+	—	—	2 months	caesarian	+	—
10	20	M	+	—	—	3 months	appendicectomy	—	+
11	28	F	+	+	—	2 months	caesarian	+	—
12	40	F	+	—	—	4 months	appendicectomy	+	+
13	22	M	+	—	—	2 months	tonsillectomy	+	—
14	30	F	+	—	—	3 months	caesarian	—	+
15	27	F	+	+	+	12 months	caesarian	+	—
16	29	F	+	—	—	4 months	caesarian	—	+
17	21	F	+	—	—	3 months	tonsillectomy	+	+

H′ = hoarseness; C″ = cough; D‴ = dyspnoea.

Age

The youngest patient in our series was 18 years old, the oldest was 40 years. The greatest incidence was between 26 and 30 years (6 cases). The youngest case recorded in literature was 21 years, the oldest was 88 years. Not a single case is recorded in a child. This apparent immunity of children is considered by Epstein to be due to the rarity of intubation in this age. The authors do not agree with this if we see the large number of tonsillectomies done for children and all are intubated. We believe that the cause is the abundance of the loose areolar tissue in the submucosa in children, and this contains rich vascular and lymphatic plexuses. This will make the submucosa somewhat yielding with the movement of the tube, and, with the increased vascularity the pressure ischaemia will be less, and, the process of healing of any possible superficial abrasion is more rapid.

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Site

Intubation granulomas are always seen in the posterior third of the larynx, mainly on the vocal process of the arytenoid, only one case was recorded on the centre of the right cord, and one at the extreme anterior end of the left cord (Young, 1953). The epithelium lining the rima glottidis is firmly adherent to the underlying tissues at the vocal process of the arytenoid and along the edge of the vocal cord. The vocal cord, being elastic, can be passively pushed and bent downwards (inwards) and upwards (outwards) with a passing tube whether rigid as a bronchoscope, or soft as an endotracheal tube; so the possibility of injury to the vocal cord itself is negligible and will occur only in cases with difficult manipulations. We also notice that with abduction of the arytenoids there is always at the same time a lateral and backward glide, due to the obliquity of the facet of the cricoid over which the arytenoids move. This backward and lateral tilt will make the vocal process more prominent and more liable to injury. This may explain why the vocal process of the arytenoid is the site of election for granuloma formation.

Pathology

It is most probable that the start of a granuloma is either a haematoma or an abrasion. The haematoma may occur in any part of the laryngeal mucosa; this will be either absorbed leaving no residue, or organize into a firm nodule. As for the abrasion or ulcer, if it occurs in an area rich in the subepithelial tissues with good vascularity, healing will take place rapidly with no residual complications, but if it occurs, however, in an area with scanty subepithelial tissues, healing will be delayed giving a chance for excessive granulation tissue formation with creeping of epithelium from the edges, as occurs with aural polyp formation. Subsequent fibrosis produces healing in a centripetal fashion narrowing the base until pedunculation occurs (Epstein, 1957).

Microscopically, all cases recorded, in which the histological picture was given, showed non-specific granulation tissue with varying degree of epithelialization. Our cases showed the same, but in addition most of them showed the presence of numerous eosinophils and evidence of infection.

Etiology

The possible etiological factors are:

1. Injury during introduction of the tube:

The bevel of all the endotracheal tubes is always towards the left, so, if introduction is tried with the vocal cords not completely relaxed, the tube will hit first the right vocal cord from its upper surface, then glides along it into the rima glottidis. A stiff tube will have a chance to scratch the mucosa during introduction. In our series we found that 11 cases were right-sided, 2 were bilateral, and only 4 were left sided. In Epstein's

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series of 10 cases, 6 were right-sided, 4 were bilateral, and none was unilateral left-sided; in the 54 cases which he collected from literature, 27 cases were bilateral, 15 were unilateral right-sided, 9 unilateral left-sided, and 3 unilateral cases in whom the side is not mentioned. In Mossad's 6 cases, 3 were bilateral, 2 right-sided and only 1 left-sided. So the incidence of granuloma occurring on the right side of the larynx is much more common than the left. This fact favours the factor of injury during introduction of the tube especially if the tube is stiff and attempts at introduction are roughly done through the blind nasal route under light anaesthesia.

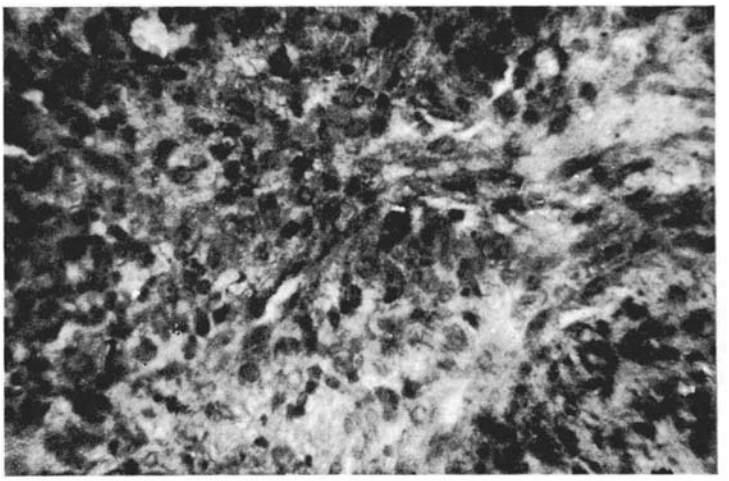


FIG. 1.
Microscopic picture of granuloma, Case No. 1.

2. Injury during extubation:

It is the usual procedure to remove the tube when the reflexes are regained so as to prevent the possibility of laryngeal obstruction. The act of pulling the tube out will produce reflex forced adduction of the vocal cords on the tube. Further pulling of the now impacted tube will produce scratching of the laryngeal mucosa and possibility of granuloma formation.

3. Static pressure of the tube during time of operation:

Duyer and colleagues (1949) demonstrated that the usual curve of the endotracheal tube may force it over the back of the glottis. Moulden and Wynne (1951), suggested that the natural resilience of the rubber tube makes it exert continuous pressure posteriorly against the arytenoid cartilages and adjacent parts of the vocal cords leading to ischaemia and ulceration of the mucous membrane which heals by granulations leading to granuloma formation. Barton (1953) demonstrated the position of the endotracheal tube being pressed against the posterior commissure, and he mentions that the difference between this position of the resilient

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tube and that of the rigid bronchoscope is that the latter lies against the anterior commissure away from contact with the vocal processes; this also explains why intubation granuloma has never been recorded as a sequel of bronchoscopy. Finer (1948), believes that the more prolonged duration of operation favours more the granuloma formation, but Epstein (1957) studying more than 60 cases demonstrated that the time factor is not important at all.

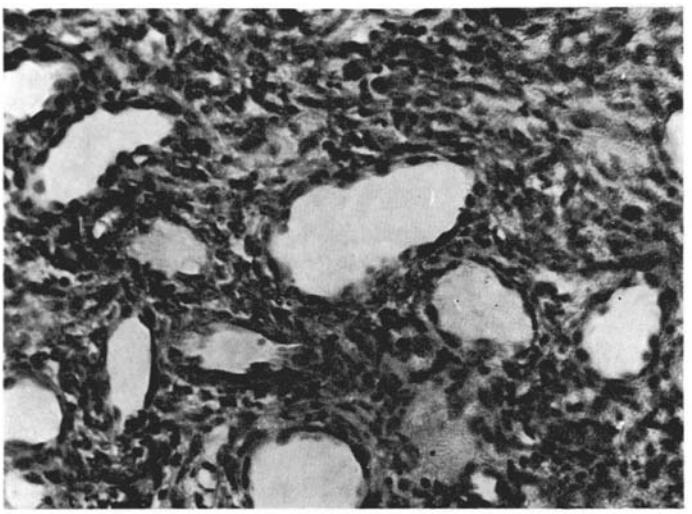


FIG. 2.
Microscopic picture of granuloma, Case No. 2.

4. The use of a too wide tube:

If a very wide tube is introduced into the larynx, it will displace the arytenoids to their utmost position of abduction they can attain; the arytenoid will now be backed and fixed by the strong crico-arytenoid ligament. By this fixation, together with the prominence of the vocal process of the arytenoids because of the obliquity of the crico-arytenoid facets, the great possibility of injury to the mucosa at this site is evident.

5. Clasping movements between vocal cords and tube after the tube has been put in position:

The tube, acting as a foreign body in the larynx, will cause reflex clasping movements of the cords. Safe depth of anaesthesia does not abolish this reflex, and so the automatic movements of the arytenoids will continue to scrape the tips of the vocal processes against the tube (C. Jackson, 1953). At the same time, trauma may take place due to vomiting or straining during recovery while the tube is still in position.

6. Sensitivity of the tissues to the rubber material, lubricant, or antiseptic:

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The presence of many eosinophils in most of the sections examined directed the attention to the possibility of an allergic factor being the cause. In the last 12 cases in our series, sensitivity tests were done against extracts from rubber of the tubes used, K.Y. jelly, vaseline, nupercaine ointment, dettol, and lysol, the possible factors in our cases. All tests proved to be negative. Young (1953) also found that the material of the tube, antiseptic or lubricant have no relation.

7. The possibility of introducing infection to an insignificant abrasion: This was suspected by Crispell and Hampton (1950). They could culture streptococci from the lubricant used and there was always evidence of secondary infection which is considered by them perhaps inevitable in this region.

Symptoms

All cases of our series complained of hoarseness of voice beginning some time after the operation. The shortest period was two months (seven cases), while the longest was one year after the operation; and the rest ranged in between. In reviewing the literature of all cases recorded, 12 began the complaint immediately after the operation; the longest latent period was 224 days, one of Epstein's. Cough is another complaint and was found in four cases of ours together with the hoarseness. Dyspnoea occurred in only one of our cases, it took place on and off and it was found to be due to a large polyloid mass which gets imprisoned below the cords.

Treatment

Removal by the direct or the indirect method is the treatment and this was done in all our cases with only one recurrence (Case No. 16). Epstein believes that removal of a sessile granuloma will expose a large bare area which will gradually heal by granulation, possibly with recurrence of granuloma formation. As there is tendency for centripetal fibrosis in the granuloma with narrowing of the base and pedunculation, provided the airway is adequate, Epstein recommends postponing the removal until this pedunculation takes place, so minimizing tendency to recurrence.

Prophylaxis

Development of intubation granuloma may be minimized if we take the following precautions:

1. The use of muscle relaxant during induction.
2. Introduction of the tube under vision by the laryngoscope.
3. Avoidance of using a too large tube.
4. Avoidance of the use of very rigid and stiff tubes, we have to use somewhat soft tubes but not soft enough to collapse.
5. The use of sufficient lubricant.

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6. Avoidance of excessive flexion or extension of the neck.
7. The tube should not be left *in situ* after the end of the operation when the reflexes have returned.
8. The tube should be extracted during the phase of inspiration.

Conclusion

Laryngeal intubation granuloma is not a common complication, yet, its presence must be borne in mind in cases of prolonged hoarseness of voice occurring in the near post-operative period. Seventeen cases are added to the literature with a study of the pathogenesis and explanation of some of the facts not hitherto explained. The aetiological factors are mainly mechanical, and some recommendations are given as an attempt to minimize its formation.

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