

Vocal process granulomata

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Abstract

The case records and histology of 34 patients with vocal process granulomata were reviewed. The five patients presenting most recently with idiopathic vocal process granulomata were investigated by axial computerized tomography (CT). Increased density of the arytenoid cartilage on the side of the lesion was found in all five cases. It is suggested that this indicates cartilage ossification, secondary to perichondritis. This perichondritis, playing either a primary or a secondary role in granuloma development, may explain the annoying tendency of vocal fold granulomata to recur after excision.

Key words: Vocal fold; Granuloma; Tomography, X-ray computed

Introduction

Granulomata arising at the vocal process of the arytenoid of the larynx present a taxing problem to patients and laryngologists alike, owing to their propensity to recur irrespective of treatment. Fortunately they are rare. Following the original description of contact ulcers of the larynx (Jackson, 1928) and contact ulcer granulomata (Jackson and Jackson, 1935), there has been considerable interest in these lesions but, to date, their underlying pathology and natural history remain obscure. It is not even certain whether vocal process granulomata and contact ulcers are separate entities (Benjamin and Croxon, 1985), or merely different stages of the same condition (Holinger and Johnson, 1960). One reason for our lack of understanding is the difficulty in obtaining adequate histological material. Ideally, to provide further insight into the condition, pathological specimens should be obtained throughout the course of the disease and should include part of the underlying arytenoid. This is clearly neither practical nor ethical and most biopsies from vocal process granulomata are small fragments, sufficient to exclude malignancy but insufficient to give any further clues about the pathogenesis of the condition. Owing to the rarity of vocal process granuloma and its benign nature, post-mortem material is virtually nonexistent. There has been one animal model, using dogs, which studied the association of acid reflux and contact ulcers. (Delahunty and Cherry, 1968). This helped to confirm the link with acid reflux, but shed little additional light on the subject.

Patients with vocal process granuloma fall into one of two broad aetiological categories: firstly those who have an ascribable aetiological factor, such as intubation (Clausen, 1932; Jackson, 1953; Snow *et al.*, 1966; Feder and Mitchell, 1984), low pitched voice (Von Lenden and Moore, 1960), vocal abuse (Jackson, 1928), habitual

throat clearing (Ward *et al.*, 1980) and gastric acid reflux (Cherry and Marguiles, 1968; Delahunty and Cherry, 1968; Ohman *et al.*, 1983; Feder and Mitchell, 1984); secondly those patients with no obvious predisposing factors i.e., the idiopathic group. Other aetiological agents such as smoking, postnasal drip and recurrent throat infections have been suggested but their roles are much less clear.

Many modalities of primary treatment and adjuvant therapy have been employed in the management of these lesions but no permutation of these modalities has demonstrated a particular advantage (Benjamin and Croxon, 1985) and multiple surgical procedures are often needed to eradicate the granulomata. This, understandably, causes anxiety to the patients which often results in them expressing dissatisfaction with their medical care.

The current study examines the symptomatology and management of 34 consecutive cases of vocal process granulomata, seen at The Royal National Throat, Nose and Ear Hospital, London.

Patients and methods

A case note review was performed on 34 patients who had presented at The Royal National Throat, Nose and Ear Hospital with histologically proven vocal process granulomata in the 10-year period from January 1982 to December 1991. The original histology was reviewed in all cases and an attempt was made to correlate this with the clinical findings. Where possible the current status of the patient was ascertained. CT scans of the larynx were performed on the five most recent patients with idiopathic vocal process granulomata. These five patients had an age range from 37 to 53 years, with a mean of 44 years.

Results

Age and sex incidence

Of the 34 patients, 25 were male and nine were female. The mean age at presentation was 47 years, but on separating the patients according to sex, the mean age in the male group was 51 years, against 35 years in the female group.

Presentation

Presenting symptoms are shown in Table I. These consisted of hoarseness, sensation of a lump or discomfort in the throat, dyspnoea, chronic cough and haemoptysis. Many patients were polysymptomatic. The commonest symptom was hoarseness, occurring in all but three patients.

Aetiological factors

The aetiology was examined and the results are depicted in Table II. Five aetiological processes were identified: vocal abuse, previous intubation, laryngeal surgery, laryngeal surgery after radiotherapy and gastric acid reflux. Reflux had been suggested for several other cases but was only accepted as an aetiological agent if supported by a positive contrast X-ray, or endoscopic evidence of reflux oesophagitis. None of the patients had undergone other tests to ascertain reflux, such as oesophageal manometry or pH measurements.

Among the patients with intubation granulomata, four had been intubated for prolonged periods in intensive care units, three had been electively ventilated overnight following thoracotomies, one of the remaining cases had received a prolonged anaesthetic for a difficult mastoidectomy, and the other had received a crash intubation for an emergency Caesarean section. Sixty-seven per cent of postintubation granulomata occurred in women.

The three cases of laryngeal surgery unrelated to radiotherapy were cases of partial cordectomy by laser in patients with abductor palsies of the vocal folds. There were 10 smokers or exsmokers in the group i.e. 29.4 per cent of the group which is a level similar to that found in the general adult population. Thirty per cent of adult women and 33 per cent of adult men in the patient catchment area are smokers (personal communication from the Islington Health Council). Therefore it is difficult to suggest that smoking is a specific aetiological factor.

Overall, 26 of the patients (74 per cent) had an ascribable aetiological factor, whereas nine (26 per cent) were idiopathic. Vocal abuse and intubation were by far the commonest causal agents. Acid reflux was identified in only three cases. It is interesting to note that all the idiopathic cases were men.

TABLE I
PRESENTING SYMPTOMS OF PATIENTS WITH VOCAL PROCESS GRANULOMATA

Symptom	No. of patients	Percentage of patients
Hoarseness	31	91
Sensation of lump or discomfort	16	47
Dyspnoea	6	18
Cough	4	12
Haemoptysis	2	6

Site of lesion

The group of patients with intubation granulomata was examined to see which vocal fold had been involved. In five cases the right vocal fold was affected, in one the left vocal fold only, and in three cases both vocal folds. This gives a total of eight granulomata on the right side and four on the left. This preponderance of right-sided lesions does not achieve statistical significance in such a small sample size ($p > 0.2$ using the Chi-square test).

Duration of symptoms prior to presentation

This had been recorded in 32 out of the 34 cases. The mean duration was 1.3 years, but this figure was skewed by one patient who waited 20 years before seeking help. The median figure was five months.

Primary treatment

Except for three cases, the initial biopsy had been performed using standard microlaryngoscopic instruments. The laser tended to be reserved for patients in whom conventional therapy had failed. The overall mean number of operations per patient was 2.7. Those with an ascribable aetiology had a mean of 2.5 operations per patient. The idiopathic group had a mean of 3.2 operations each. The success rate of treatment is shown in Table III.

Adjuvant treatment

Adjuvant therapy also tended to be reserved for those with recurrent disease. Various modes of treatment were used: speech therapy, antibiotics, antacids, steroids (both locally and systemically), vitamin and mineral supplements. Some patients had sought treatment from practitioners of alternative medicine. When used, adjuvant treatments tended to be administered in a blunderbuss fashion: patients with idiopathic granulomata received adjuvants such as antacids, which one would have expected to have been reserved for cases with specific aetiologies. In the group that received adjuvants, the mean number of operations was 3.4, supporting the view that these measures were reserved for the more problematical cases.

Radiology

CT scans were performed on the five most recent cases. In all cases the arytenoid cartilage on the affected side was more radiodense than on the contralateral, uninvolved side (Figures 1 and 2).

Histology

The histological appearances of the lesions were qualitatively similar in all cases and in accord with the findings of others (Wenig and Heffner, 1990). Thirty-three out of the 34 cases showed some degree of ulceration of the surface epithelium and in 21 cases this was extensive (Figure 3). In 10 cases the residual squamous epithelium demonstrated some degree of hyperplasia. In all examples there was a marked capillary proliferation beneath the surface, together with a mixed inflammatory infiltrate of varying severity (Figure 4). Fibrosis was a prominent feature in

TABLE II
AETIOLOGY OF VOCAL PROCESS GRANULOMATA

Aetiological factors	No. of patients	Percentage of total	Male	Female
Vocal abuse	8	23	7	1
Intubation	9	26	3	6
Laryngeal surgery	3	9	1	2
Laryngeal surgery postradiotherapy	2	6	2	0
Reflux	3	9	3	0
Idiopathic	9	26	9	0

nine patients, but this feature was not related to the duration of the lesion. No pattern of histological change was found that was specific for any single aetiology, suggesting that the appearances are a stereotyped response to trauma of varying types. No cartilage or perichondrium was included in any of the specimens.

Discussion

The male to female ratio and age range were similar to those reported in other studies (Jackson and Jackson, 1935; Benjamin and Croxon 1985). All but one of the women in the current study had sustained direct trauma to the larynx, either in the form of intubation or laryngeal surgery. The excess of women in the postintubation group has been noted previously (Snow *et al.*, 1966) and it has been suggested that because women have smaller larynges with thinner mucosa they are more susceptible to trauma from endotracheal tubes. Nineteen out of the 20 noniatrogenic cases were male and within the vocal abuse subgroup men accounted for seven out of eight cases. This may be explained by the extra stress and strain exerted on the arytenoids by the low-pitched masculine voice and heavy glottic attack. The absence of women in the idiopathic group suggests that there is something inherent in the male larynx predisposing it to this chronic inflammatory condition.

The commonest mode of presentation was hoarseness, followed by throat discomfort, sensation of a lump in the throat and a chronic cough. This is in keeping with previous studies (Jackson, 1928; Snow *et al.*, 1966; Benjamin and Croxon, 1985).

When examining the site of the lesions, a small non-statistically significant preponderance of right-sided granulomata was found in the postintubation group. This observation has been noted previously (Balestrieri and Watson, 1982). The anaesthetic laryngoscope is a left-handed instrument and the endotracheal tube is therefore introduced from the right and secured so it lies in the right side of the mouth, pharynx and larynx, increasing the likelihood of trauma to the right vocal fold.

The use of the CO₂ laser and adjuvant therapeutic measures in various permutations did not seem to accelerate resolution of the lesions. These observations mimic

those of previous workers (Benjamin and Croxon, 1985). However, both the laser and adjuvants tended to be reserved for patients who had not responded to conventional microlaryngeal surgery and hence a more recalcitrant subgroup of lesions was selected for these treatment modalities.

Five patients were investigated using CT scanning and in all cases the scans showed increased radiological density of the arytenoid cartilage on the side of the granuloma. The normal arytenoid is composed largely of hyaline cartilage with a small amount of elastic cartilage at the apex. From early adulthood the hyaline laryngeal cartilages start to calcify, starting with the thyroid, then the cricoid and finally the arytenoids (Weir, 1987). The bodies and muscular processes of the arytenoids calcify but the vocal processes tend not to undergo calcification. The arytenoids usually calcify in a symmetrical fashion (Jurik, 1984) and the calcification rarely involves the whole cartilage (Ardran and Kemp 1966). The current study showed that in all five cases the arytenoid on the affected side was more densely calcified than the normal side. The calcification also extended into the vocal process (Figure 2). These observations suggest that the calcification on the affected side is pathological rather than a normal age-related change. Similarly increased arytenoid attenuation on CT scanning has been reported in cases of laryngeal carcinoma prior to laryngectomy (Lloyd *et al.*, 1981). These arytenoids were subsequently examined histologically, showing marked perichondritis with evidence of ossification of the cartilage. We therefore use this indirect

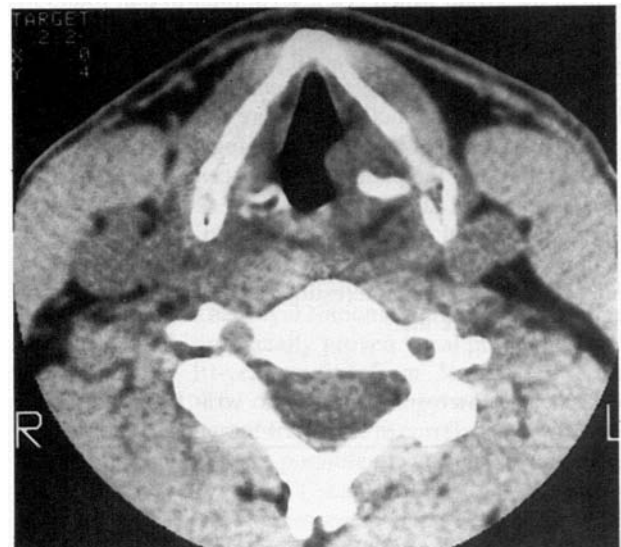


Fig. 1

Axial CT scan of the larynx of a patient with vocal process granuloma, demonstrating a soft tissue mass medial to the left vocal process, with increased radiodensity of the underlying arytenoid.

TABLE III

TREATMENT OUTCOME FOR PATIENTS WITH VOCAL PROCESS GRANULOMATA

Current status	No. of patients
Granuloma eradicated	22
Granuloma present but asymptomatic	4
Granuloma present and symptomatic	6
Uncertain as patient lost to follow-up	2

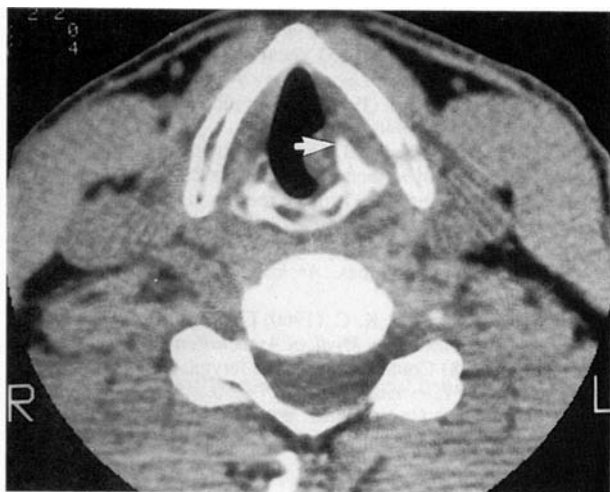


Fig. 2

Axial CT scan of the larynx in a case of vocal process granuloma showing increased radiodensity of the left arytenoid, extending into the vocal process (arrowed).

evidence to suggest that a similar chronic inflammatory process occurs in the patients with granulomata. For ethical reasons, we have not repeated the CT scan on any of the patients whose granuloma has resolved. In any case, we would expect any ossification to be permanent once established and therefore would also expect the increased radiological density to remain.



Fig. 3

Low power micrograph of a vocal process granuloma showing ulceration of the surface epithelium. (H & E; $\times 40$).

Delahunty and Cherry (1968) produced an experimental animal model of vocal fold granulomata but did not comment on the state of the underlying arytenoid. It would be useful to repeat these experiments using a longer time course and look specifically for perichondritis or, in long-standing cases, ossification of the arytenoid.

The patients who developed granulomata after surgery fell into two groups: (i) those who had partial cordectomies for abductor palsies and (ii) those who had their surgery after radiotherapy. The first group, by the nature of the operation, sustained surgical trauma to the arytenoid; the latter group had operations performed in an area of diminished oxygenation and could therefore be expected to show abnormalities of reparation.

Taking all the above, albeit indirect, evidence into consideration, it is possible that perichondritis is the causative factor in the formation of vocal process granulomata and that it, in turn, can be triggered by various disparate factors. This would explain the unique site of occurrence of granulomata, overlying the arytenoid, and the tendency of the lesions to recur after excision, due to the persisting perichondritis. Most of the current treatments that are used as adjuvants to surgery, such as speech therapy and antacids remove the trigger factor but fail to treat the underlying perichondritis. Cases have been reported (Clausen, 1932; Benjamin and Croxon, 1985) where granulomata have been coughed out by the patient and the condition did not subsequently recur. This may represent spontaneous resolution of associated perichondritis. Cer-

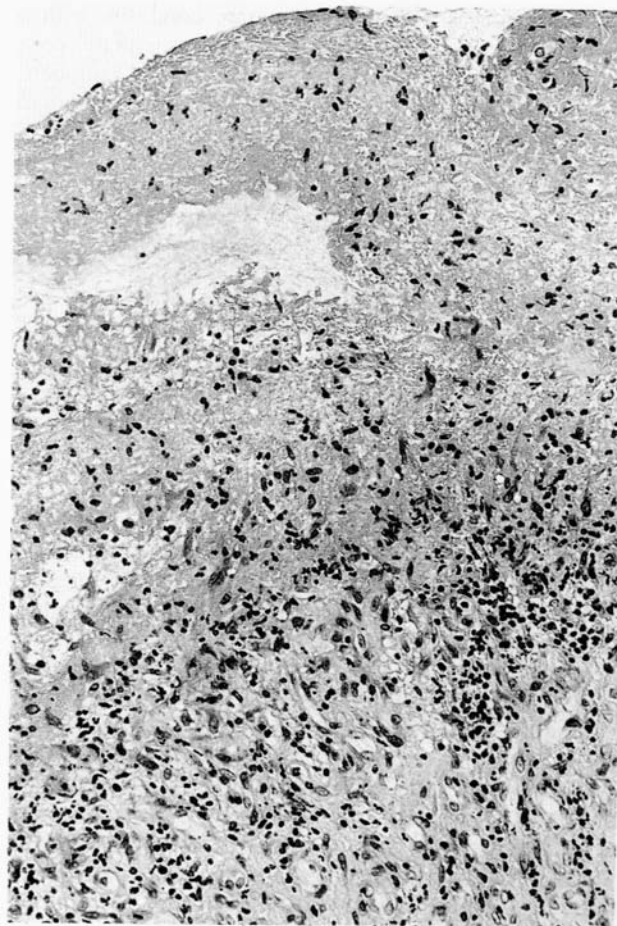


FIG. 4

Micrograph of a vocal process granuloma showing mixed cellular infiltrate. (H & E; $\times 250$).

tainly, the lesions tend to eventually resolve, irrespective of the mode of treatment and in the current study, the majority of patients eventually achieved cure. Twenty-two of the 34 patients have had their granulomata eradicated, undergoing a total of 51 operations, ranging from one to eight procedures per patient.

The management strategy suggested by this review should consist of the usual careful history and examination, a speech assessment and an assessment of the presence or absence of gastric acid reflux. Ideally this should be oesophageal manometry, pH measurements or at least oesophagoscopy and biopsy. The time honoured barium swallow is a rather insensitive test for oesophago-pharyngeal acid reflux. If reflux is detected, drug treatment with a proton-pump inhibitor such as omeprazole or an H₂-receptor antagonist such as ranitidine should be instituted. Sensible voice rest and reduction of glottic attack is probably a good common sense regime to undertake as it would minimize further trauma to the arytenoid, irrespective of the aetiology. A surgical biopsy is clearly desirable, to exclude malignancy. This should be carefully performed, to minimize further traumatic stimulus to granuloma formation. Multiple subsequent surgical biopsies should be avoided as far as possible unless symptomatically demanded. Steroids, antibiotics, minerals and vitamins probably have little effect on the arytenoid perichondrium.

Conclusion

Vocal process granuloma is a rare condition with a poorly understood pathogenesis. In patients with this condition, CT scans of the larynx show increased radiodensity of the arytenoid on the affected side. This appears to be a specific pathological change and we suggest it represents ossification of the arytenoid cartilage secondary to overlying perichondritis. The soft tissue mass in the glottis may therefore represent the tip of a pathological iceberg and this may explain why treatment of these lesions remains a frustrating and lengthy undertaking.

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