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Pathology in Focus

Post-stapedectomy reparative granuloma: a misnomer

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Abstract
The pathophysiology of so-called 'reparative granuloma' occurring after stapedectomy has not been determined and universally accepted management of this rare complication has not yet been established. A case is presented in which a mass developed in the middle ear after the use of a fat/wire prosthesis in a stapedectomy. Histological assessment revealed nonspecific granulation tissue and fat necrosis. It is suggested that 'reparative granuloma' is a misnomer as there is no microscopic evidence in this case nor in the literature of granulomatous formation. The condition may follow stapedectomy or stapedotomy. Furthermore, the name leads to confusion with a different condition, giant cell reparative granuloma, which involves the jaws and rarely the temporal bone. An alternative name, 'Stapes surgery induced granulation tissue' (SSIG) is therefore suggested for this condition.

Key words: Stapes surgery, complications; Granuloma

Introduction

An unusual complication of stapes surgery is the development of an excessive repair and inflammatory reaction, which forms a mass in the middle ear and absorbs or dislodges the prosthesis. This has been termed 'post-stapedectomy granuloma' or 'reparative granuloma'. The incidence of this complication after stapedectomy has been estimated at 0.1 per cent and after stapedotomy at 0.07 per cent (Seicshnaydre *et al.*, 1994). It is generally associated with the use of wire and gelfoam or fat grafts, although it has been reported with all types of prosthesis and graft. The aetiology is unknown and a number of theories exist (Seicshnaydre *et al.*, 1994). These include autoimmune and allergic reactions or an overexuberant healing process. The management of this condition provokes disagreement.

Case report

A 32-year-old female was referred to the senior author (P.A.F.) with a three-day history of dizziness and associated nausea and retching. She had had a left-sided stapedectomy performed 10 days previously during which a fat/wire prosthesis had been inserted. On examination she had a small amount of gelfoam and blood clot in the external auditory canal, a dull otherwise unremarkable tympanic membrane and the Weber tuning fork test lateralized to the operated ear. The remainder of her clinical examination was normal. Pure-tone audiometry (Figure 1) revealed a reduction of the air-bone gap and no change in the bone conduction reserve when compared to the pre-operative audiogram (Figure 2).

She was admitted and treated conservatively with bed rest and anti-emetics. Weber testing continued to lateralize to the operated ear and there was no change in her hearing during the subsequent four days. Speech discrimination remained at 100 per cent. She continued to complain of dizziness and although there was an initial improvement in her balance in the first 24 hours her disequilibrium persisted with no further clinical progress.

She underwent an exploratory tympanotomy, under local anaesthesia, 15 days after her initial procedure. The greater part of the middle ear was found to be filled with a ball of inflammatory tissue surrounding the transposed fat. It was densely in contact with the tympanic membrane and had wrapped up the long process of the incus and the attached wire. It filled the oval window overflowing the horizontal portion of the facial nerve. The inflammatory tissue was removed in its entirety without provoking vertigo at any stage. The oval window was sealed with some previously prepared fine fascia which was stabilized with a small piece of gelfoam. It was decided at that time not to reconstruct the ossicular chain as the operative field was quite bloody and stabilization of the ear was the priority.

The specimen received for histopathology was a mass of tissue 5 × 3 × 2 mm with a fine wire attached, corresponding to the fat/wire prosthesis used at surgery. Histopathological examination after removal of the wire demonstrated that the specimen was predominantly granulation tissue in which there were foci of haemorrhage and entrapped cuboidal epithelium appropriate to the middle ear. There was a small amount of residual adipose tissue, but most of the fat graft appeared to have been resorbed (Figure 3). On higher power examination, there was a small amount of viable adipose tissue, but some of the residual fat showed evidence of fat necrosis, with finely divided fat globules and foamy macrophages. There was an accompanying infiltrate of lymphocytes and haemosiderin-

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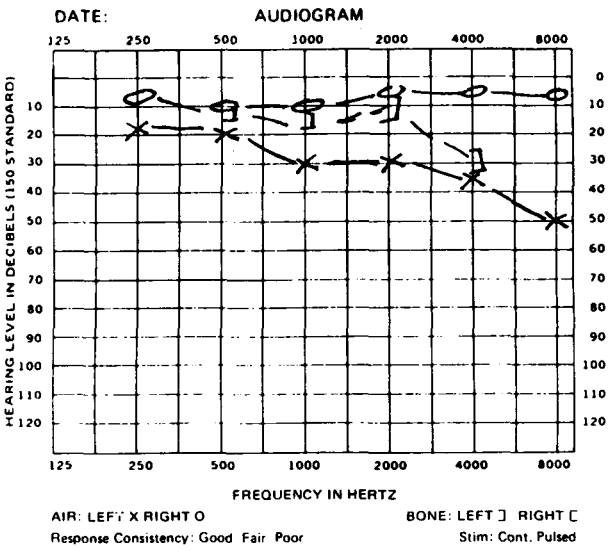

FIG. 1
Pure-tone audiogram 14 days post-stapedectomy and one day pre-exploratory tympanotomy.

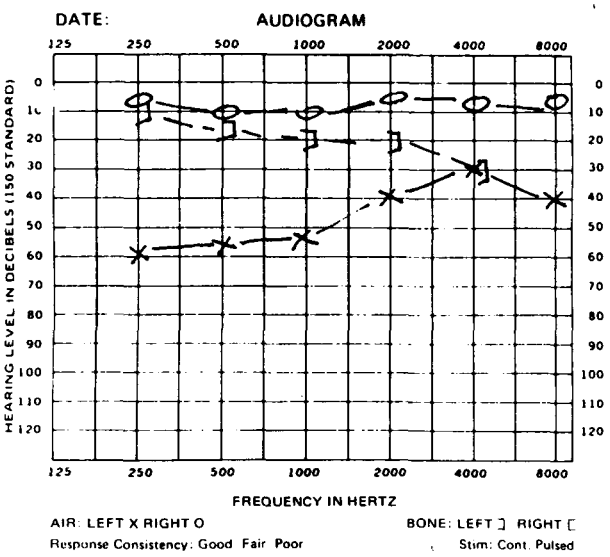

FIG. 2
Pre-stapedectomy pure-tone audiogram.

laden macrophages. There were occasional multinucleated giant cells, but no bi-refringent foreign material (Figure 4).

The patient's post-operative course was uneventful and pure tone audiometry performed two months after the revision procedure revealed no change in her bone conduction reserve with speech discrimination remaining at 100 per cent. An ossicular reconstruction will be considered at a later stage.

Discussion

A recent postal questionnaire on poststapedectomy reparative granuloma (RG) by Seicshnaydre *et al.* (1994) to the members of the American Otological and Neurotology Societies engendered a 38 per cent response rate. The average number of RG, encountered by those who replied, was two per total number of stapedectomies and one for all stapedotomies performed at their respective units. Four respondents doubted the very existence of this complication.

Macroscopically the lesion is a clump of granulation tissue and this presumably is why the term 'reparative granuloma' was coined despite the fact that histologically there is no evidence of granulomatous inflammation in this case nor in the literature. Non-specific granulation tissue is the consistent finding in all histology reports on this pathological process (Kaufman, 1967; Gacek, 1970). In surgery the term 'granuloma' is often used to denote a localized mass regardless of histology, for example in such diverse conditions as apical 'granuloma' of tooth (inflammatory), intubation 'granuloma' (granulation tissue), pyogenic 'granuloma' (haemangioma) and eosinophillic 'granuloma' (histiocytic neoplasm). In histopathology, granuloma is defined as a small localized collection of epithelioid histiocytes, often with multinucleated giant cells, surrounded by a rim of lymphocytes (Cotran *et al.*, 1994). The finding of chronic granulomatous inflammation has specific aetiological implications, including mycobacterial and other specific infections, foreign body reaction or systemic vasculitis and therefore, use of the term granuloma is best restricted to the strict pathological definition. The term 'reparative granuloma' could also lead to confusion with a different condition, giant cell reparative granuloma, which occurs in the jaws and rarely the temporal bone, and in which osteoclastic giant cells are a prominent feature. The term 'post-stapedectomy granuloma' is inaccurate also as this complication occurs after stapedotomy as well. For the above reasons, we consider that 'post-stapedectomy reparative granuloma' is an inaccurate term for the clinical condition and suggest that stapes surgery-induced granulation tissue (SSIG) is a more exact term.

The pathogenesis of SSIG remains uncertain. The general view is that SSIG is more commonly associated with the use of gelfoam or fat grafts (Seicshnaydre *et al.*, 1994). This is the first case in which fat necrosis and resorption of the fat graft has been described histologically. The reason for the onset of fat necrosis was not obvious as there was no evidence of infection nor foreign body reaction. Local inflammation was present but this could have been either the instigator or the consequence of fat necrosis. Poor vascular supply, an autoimmune reaction or an exuberant reparative process are all possible.

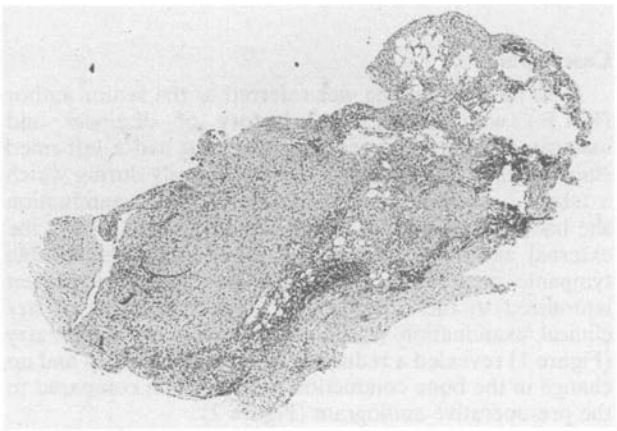

FIG. 3
Low power view of the surgically excised tissue after removal of the wire. The tissue is predominantly granulation tissue with only a small amount of residual adipose tissue (upper right and centre). (H & E; × 2).

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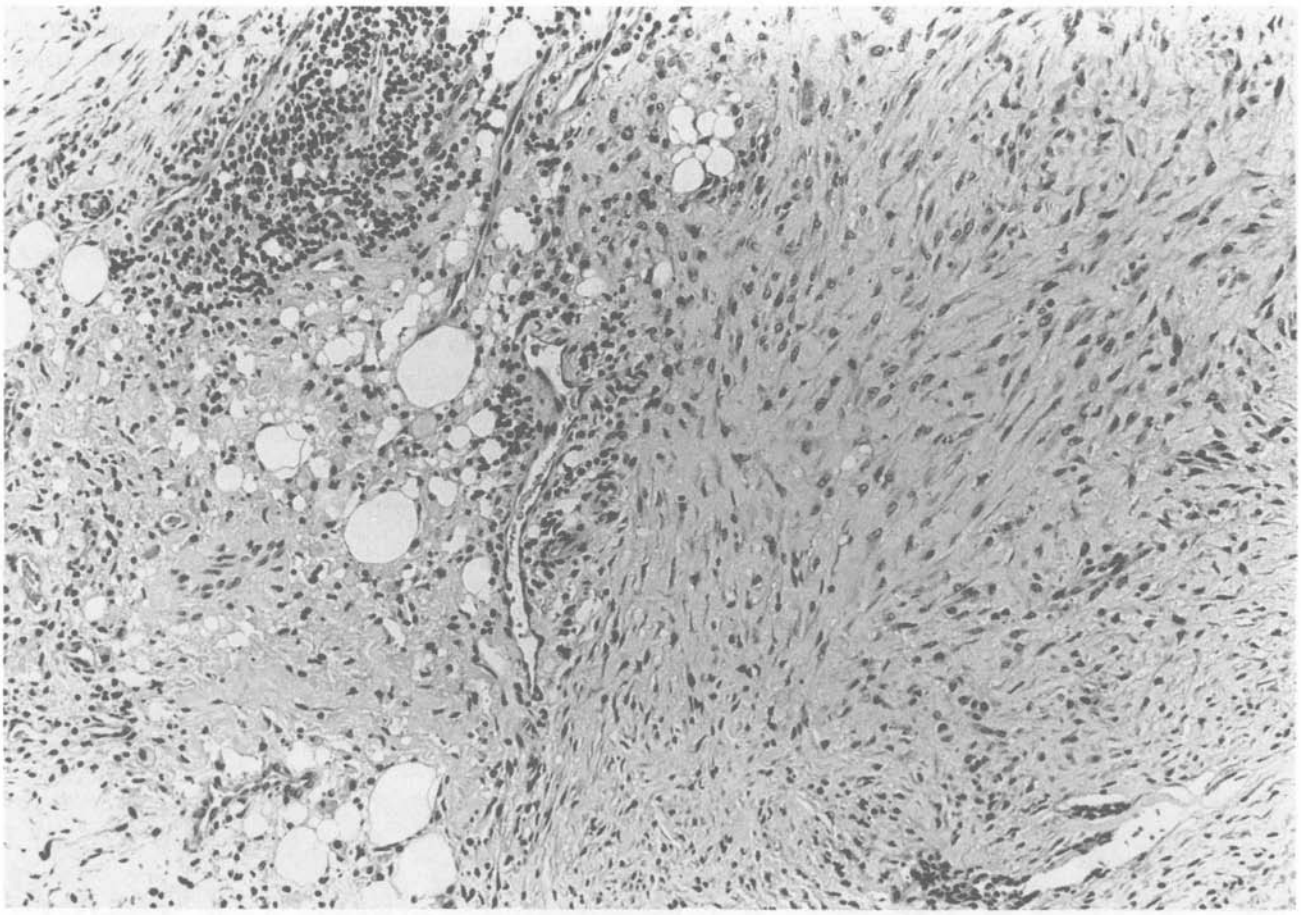

FIG. 4

High power view to show granulation tissue on right. On the left is adipose tissue with evidence of partial fat necrosis, namely loss of many adipocytes, presence of finely divided fat globules and presence of foamy macrophages. Chronic inflammation is also present. (H & E; × 10).

The principal symptom heralding the advent of a SSIG is the development of a sensorineural hearing loss in the operated ear within one to six weeks of the stapes surgery after an initial improvement in hearing (Kaufman and Schuknecht, 1967; Gacek, 1970). SSIG should be suspected when sensorineural hearing loss and disequilibrium (i) persist beyond, (ii) appear *de novo* or (iii) worsen, several days post-operatively. These symptoms in the first four to five days after the procedure are indicative of serous labyrinthitis which is relatively common (Gacek, 1970). The incidence of sensorineural loss in SSIG varies from 70 to 100 per cent of patients with speech discrimination falling to 60 per cent in some instances (Wiet *et al.*, 1993). Vertigo is reported to occur in 20 to 35 per cent of cases (Wiet *et al.*, 1993), and usually in association with hearing loss although the most commonly reported manifestation by the respondents in the study of Seicshnaydre *et al.* (1994) was vertigo. This case supports this anecdotal evidence in that the level of hearing remained constant and vertigo was the sole presenting symptom. Some authors (Gacek, 1970) state that the tympanic membrane is typically dull and erythematous but it is difficult to diferentiate the normal healing process from a SSIG on inspection of the eardrum in the early post-operative period and otoscopic examination alone would not have persuaded the authors of this case report to make a definitive diagnosis.

Swartz *et al.* (1986) studied CT scans of 44 patients (64 ears) post-stapedectomy and diagnosed correctly the presence of a SSIG in one case; as well as recognizing problems in other patients including protrusion of the prosthesis in the vestibule. CT should therefore be considered in patients who develop symptoms of post-stapedectomy complications.

Management of SSIG remains controversial ranging from conservative management using steroids to early surgical intervention (Seicshnaydre *et al.*, 1994). We were able to preserve this patient's hearing and retain normal speech discrimination by operating within a week of the onset of symptoms which is in keeping with reports that early removal prevents sensorineural hearing loss (Gacek, 1970). In contrast, the case reported by Seicshnaydre *et al.* (1994), where high-dose steroids were administered immediately and exploratory tympanotomy delayed for four weeks, was followed by a severe sensorineural hearing loss with 0 per cent word discrimination. We did not make any attempt to perform an ossiculoplasty as the objective in these cases is to save hearing and the excessive bleeding associated with the granulation tissue would have made the procedure extremely difficult and compromised an already unstable ear. This case suggests that operative management without ossicular reconstruction, sooner rather than later, is the treatment of choice and not that surgery is contra-indicated as proposed by Hough and Dyer (1993), who do not support their non-operative treatment protocol with published results.

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