Reparative granuloma following stapes surgery

A. Mahadevaiah · Bhavin Parikh · K. Kumaraswamy

Abstract

Reparative granuloma of the oval window is an uncommon complication of stapes surgery, which usually develops within one to six weeks after operation and causes a sudden hearing loss and disturbance of balance. We report 2 cases of post-stapedectomy reparative granuloma that developed during the tenure of senior surgeon (AM).

Keywords Reparative granuloma · Stapes surgery induced granulation tissue · Post-stapedectomy granuloma

Introduction

Reparative granuloma is defined as a histologically confirmed formation of granulation tissue involving the prosthesis and the oval window in a symptomatic patient following stapes surgery [1]. The term reparative granuloma is a misnomer [2] as the lesion does not involve granulomatous inflammation and stapes surgery induced granulation tissue is more appropriate term.

The exact etiology for reparative granuloma is unknown. However various theories exist which includes pyogenic and foreign body inflammation, autoimmune and allergic reactions or an over exuberant healing process. Management varies from immediate exploration and surgical removal to conservative treatment with steroids and antibiotics.

Case Reports

Two patients out of 3600 patients who underwent stapedectomy at our centers were diagnosed to have reparative granuloma. They underwent primary stapedectomy under local anesthesia. The ear was prepped with betadine solution and irrigated with saline solution. All had pre-operative broad-spectrum antibiotic (ciprofloxacin and gentamycin) two hours prior to surgery. The stapedectomy technique included transcanal tympanotomy, fenestration of footplate, removal of posterior third footplate, placement of Teflon piston and seal of fibrofatty tissue for oval window closure. No gelfoam was used in the middle ear. We hereby report the clinical presentation, histopathological, operative findings and management.

Case 1

VK, a 35-year-old lady presented with bilateral moderately severe conductive hearing loss. She underwent left stapedectomy with insertion of 0.5 mm*3.75mm Teflon piston and fibro-fatty tissue seal. She had immediate subjective improvement without any vertigo. However, she reported

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after three weeks with diminished hearing and rotatory vertigo since five days. Otologic findings revealed congested retracted drum and audiogram revealed mixed hearing loss. She was advised absolute bed rest, anti-vertigo drugs and oral steroids for five days. Her hearing and vertigo failed to improve. Therefore, her left ear was re-explored in fourth post-operative week. Extensive granulations were found in middle ear around the piston, incus, and oval window extending into vestibule, attic and the antrum. She underwent simple mastoidectomy with tympanoplasty with removal of all granulations along with piston and incus without ossiculoplasty. Post-operatively her vertigo settled over one month but she developed a total sensorineural hearing loss. The granulations sent for histopathological examination revealed inflammatory vascular granulation tissue.

Case 2

GR, A 45-year-old lady presented with left moderate conductive hearing loss and tinnitus. She was a known diabetic on treatment. She underwent left stapedectomy with insertion of 0.4 mm* 4.25 mm Teflon piston with fibro fatty tissue seal over oval window. She had good improvement in post-operative hearing. But she noticed progressive worsening in hearing over 2 weeks after two months of surgery. There was no associated vertigo. Otoscopic examination revealed granulations in external auditory canal and over tympanic membrane with piston adherent to it. Her audiogram revealed severe mixed deafness. She underwent exploratory tympanotomy and mastoidectomy, which revealed extensive granulations around oval window eroding the promontory and tensor tympani canal causing necrosis of tensor tympani muscle tissue. Long and lenticular processes of incus were also necrosed. The granulations were removed meticulously; oval window sealed with temporalis fascia graft and second stage ossiculoplasty was advised if there is residual hearing. Her histopathological findings were similar to prior patients. However, we had sent the granulations for bacterial and fungal culture sensitivity that showed growth of pseudomonas species and *Fusarium* and *Candida* species respectively. She was given the oral antibiotic and antifungal accordingly. She also developed severe sensorineural hearing loss.

Discussion

The incidence of reparative granuloma varies from 0.1 % for stapedectomy and 0.07% for stapedotomy [3]. However certain studies have estimated the incidence upto 1.3% [4] to 1.8% [5]. We noted incidence of 0.06% (2 out of 3600). Such a low incidence leads to exposure to about one to two reparative granuloma in a lifetime of a frequent stapes surgeon.

Reparative granuloma should be expected when sensorineural hearing loss and vertigo persist beyond or appears

de novo several days post-operatively [2]. Presenting symptoms usually surface one to eight weeks following surgery and most commonly involve vertigo but may include sensorineural hearing loss, progressive mixed hearing loss, sudden hearing loss and tinnitus [3, 7]. Our patients presented with progressive sensorineural hearing loss in both of them and vertigo in one of them. Presenting symptoms had good correlation with intra-operative involvement of middle and inner ear structures. Otoscopic findings are variable and inaccurate to guide further management. It may range from dull tympanic membrane to grayish-red mass in posterosuperior quadrant of the drum to frank granulations over drum and in external auditory canal.

A consistent finding at the time of surgical exploration was a red, soft vascular mass around oval window niche surrounding the piston and long process of incus. In one case, the piston was displaced from long process of incus that was necrosed. There was fulminant inflammation with granulations involving the adjoining structures. In two cases it was going into vestibule and in one of them it had eroded promontory and tensor tympani canal. We opened mastoid air cells in all of them and found it to be involved with granulations. There was no frank suppurative infection in the middle ear.

Histopathological examination of the granulation removed revealed a dense vascular inflammatory granular tissue with sheets of plasma cells, few lymphocytes and neutrophils. A small amount of adipose tissue of previous tissue seal was seen and occasionally host bone tissue was also noted. There was no evidence of tuberculosis or fungal infection or foreign body giant cells.

We considered microbiological evaluation of the granulation tissue in the last case as we noticed that none of the present literature has evaluated the role of bacterial and fungal culture. We found the bacterial culture showing moderate growth of pseudomonas as well as fungal culture showing moderate growth of candida parapsilosis and *fusarium* species.

The etiology of reparative granuloma is unknown and a number of theories exist. Inflammatory response to various foreign bodies [5, 6, 7] has been described as possible etiology. Foreign body material may be intentionally or accidentally introduced at operation. Fat and gelfoam used for tissue seal was initially considered the culprit. However, it appeared that reparative granuloma occurred as frequently with gelfoam-wire as with fat-wire inserts. Also the type of prosthesis used does not appear to change the phenomenon. Teflon [6], wire-teflon [7], stainless steel [7] and gold piston [4] implantation are all mentioned along with reparative granuloma. Thus type of prosthesis and graft does not appear to influence the formation of reparative granuloma.

Accidental foreign bodies including cotton wool fibers, linen fibers from drapes, glove powder (talc or starch) [6] and fractured Teflon fragments have been considered to stimulate foreign body granuloma. However, Kaufman et al [7] and Buntner et al [5] found these materials to be non-

contributory. We could not find foreign body giant cells histopathological slides of any of our patients.

Dawes et al [6] mentioned pyogenic inflammation as one of the causes but since there is no gross infection, its role, as a causative agent has not got much support. However, to our knowledge no detailed study regarding infection etiology has been pursued in recent times. Though histopathological examination did not reveal any fungal/tuberculosis inflammation, bacterial and fungal cultures were positive in one of the patient. Poor vascular supply, an autoimmune and allergic reactions or exuberant reparative process is also possible [3].

There is disagreement regarding the mode of management of reparative granuloma. While Kaufman et al [7] advocate immediate surgical exploration and removal of granulation with replacement of prosthesis. Seicshnaydre et al [3] mentioned the use of high-dose steroids and antibiotics followed by delayed surgery. Hough and Dyer [8] considered surgery to be contra-indicated in such patients. However, we agree with Fenton et al [2] in considering immediate exploration and meticulous removal of granulations followed by delayed ossiculoplasty if there is residual hearing.

Whatever be the mode of treatment, prognosis of reparative granuloma as regards to hearing preservation is poor. But surgical intervention appears to give better outcome and early operation can save the hearing [2, 7].

Conclusion

Reparative granuloma after stapes surgery though rare fortunately, is still an important cause for sensorineural hear-

ing loss. A better understanding is required regarding its pathophysiology and management. Because of its rarity, no single center would be able to give conclusive evidence and we suggest a pre-planned multi-center study for it.

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