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Spontaneous bone regeneration after segmental mandibular resection: a retrospective study of 13 cases

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Abstract. The aim of this study was to evaluate the clinical characteristics of cases of spontaneous bone regeneration of the mandible after segmental resection. This retrospective study covered a 23-year period and used data obtained from the hospital records; patient data were entered into a pro-forma questionnaire. Overall, the cases of 636 patients with mandibular lesions treated by segmental resection were reviewed; 13 (2.0%) had spontaneous bone regeneration. The time post-surgery at which bone regeneration was first noticed ranged from 9 to 17 weeks. Seven patients were male (53.8%) and six were female (46.2%), giving a male to female ratio of 1.2:1. The patients ranged in age from 16 to 51 years (mean 26.6 ± 3.6 years). The periosteum was completely excised after resection in eight patients (61.5%), while it was partially preserved in five (38.5%). The younger the patient, the earlier the spontaneous bone regeneration occurred in the defect ($P = 0.001$), particularly in those who had complete excision of the periosteum. Radiographically, the new bone formed was observed to have the same appearance as the cortical bone of the mandibular stumps, but lacked height. This study suggests that bone graft reconstructions may still be necessary for this group of patients who show spontaneous bone regeneration.

Key words: mandible; lesion; resection; bone regeneration.

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Certain lesions that affect the mandible may progress to significant destruction of its structures, requiring ablative procedures that leave composite defects. Segmental mandibular resection is sometimes employed to eradicate these disease conditions within the mandible, and this has attendant adverse consequences on the patient's quality of life. These composite defects have been repaired with autologous bone grafts, homologous grafts, or heterogeneous materials, with added morbidity and complications for the patient.[1–3] However, cases of spontaneous bone regeneration after mandibular resection have also been reported in the literature.[4–6] Several factors are suggested to influence the occurrence of this uncommon and unexpected phenomenon, including the presence of an intact periosteum, infection, postoperative

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stabilization of the remaining mandibular stumps, young patient age, and genetics, among others.[7–10] The benefits of spontaneous bone regeneration, which would obviate the need for reconstructive surgery, cannot be overemphasized, particularly in environments where most patients struggle to make ends meet because of economic hardship.

Only a few cases of spontaneous bone regeneration of the mandible have been documented in the literature, and all have been in the form of case reports. The present retrospective study was performed to evaluate the clinical characteristics of cases of spontaneous bone regeneration after segmental mandibular resection over a period of 23 years at the authors' institution.

Materials and methods

This retrospective study was designed to evaluate subjects treated for mandibular lesions with segmental resection in the oral and maxillofacial surgery clinic of the study institution between June 1992 and May 2015, and thereafter to characterize those who developed spontaneous bone regeneration. The cases of 636 patients were evaluated. The study was granted an exemption in writing from ethical clearance by the research and ethics committee of the institution because of the retrospective design. All known patients who presented spontaneous bone regeneration within this period were included in the study. The diagnosis of spontaneous bone regeneration was made postoperatively, during routine clinical and radiographic follow-up examinations of the surgical sites.

Information obtained from the hospital register, case files, and plain radiographs of the subjects were recorded in a proforma questionnaire designed for the study. The following information was recorded: age, sex, type of mandibular lesion, preoperative use of antibiotics, status of the periosteum and soft tissue envelope of the mandible, size of the defect, time and site of bone regeneration, associated comorbidities, and follow-up. The site of bone regeneration of the mandible was sub-divided into right half (body), left half (body), and midline (symphysis and parasymphysis region). The data obtained were analyzed using Epi Info version 7 software (Centers for Disease Control and Prevention, Atlanta, GA, USA).

Results

Of the 636 patients evaluated, 13 (2.0%) had spontaneous bone regeneration at the surgical site postoperatively after segmental resection. Seven were male (53.8%) and six were female (46.2%), giving a male to female ratio of 1.2:1 (Table 1). The patients ranged in age from 16 to 51 years, with a mean age of 26.6 ± 3.6 years. The younger the patient, the earlier the spontaneous bone regeneration occurred in the defect ($P = 0.001$), particularly in those who had complete excision of the periosteum (Table 1). Antibiotics were not given preoperatively to any of the patients. However, postoperative antibiotics were prescribed for all patients and there was no active infection during this phase of management. Ameloblastoma ($n = 8$, 61.5%) was the most common type of lesion treated surgically. The predominant site of regeneration was the body of the mandible, with an equal distribution of left and right sides; the symphysis and parasymphysis regions were less frequently involved (Table 1).

Postoperatively, all patients were placed in intermaxillary fixation (IMF) on the second day, and this was maintained for 6 weeks. The size of the mandibular defect ranged from 4.7 to 15.3 cm, with a mean span of 10.4 ± 1.8 cm. The majority of the patients had a span of less than 12.6 cm ($n = 10$, 76.9%). The greater the size of the defect, the greater the number of comorbidities ($P = 0.01$) (Table 2). Also, numbness of the lower lip and part of the cheek on the affected side was recorded for all of the patients.

The time after surgery at which bone regeneration was first noticed by the surgeon ranged from 9 to 17 weeks. Viewed radiographically, the new bone formed had the same appearance as the cortical bone of the mandibular stumps, but lacked height (Figs. 1–3). The new bone formed did not cover the entire defect (incomplete span) in three of the 13 cases (23.1%), while the entire defect was covered (complete span) in 10 (76.9%). The periosteum was excised completely after resection in eight of the 13 cases (61.5%), while it was partially preserved in five (38.5%) (Table 1). Postoperatively, the soft tissue envelope of the mandible was preserved in all cases. The mean follow-up period after treatment of the mandibular lesions was 18 ± 1.2 months (range 15–59 months).

Reconstructive surgery was delayed in the 636 patients for a minimum of 1 year. Subsequently, of the remaining 623 (98.0%) patients without spontaneous bone regeneration, 129 (20.3%) were referred to other centres for reconstruction and prosthetic procedures, while the rest ($n = 494$, 77.7%) decided to come to terms with their deformities or were lost to follow-up.

Discussion

Spontaneous bone regeneration is an uncommon and unexpected form of osseous repair in which osseous tissues grow into critically sized bone defects. This study

Table 1. Patient characteristics.

No.	Age (years)	Sex	Type of lesion	Site	Status of periosteum	New bone first detected (weeks)
1	16	Female	Mural ameloblastoma	Left	Excised	10.5
2	17	Female	Mural ameloblastoma	Right	Excised	9.0
3	19	Male	Central giant cell granuloma	Right	Excised	12.4
4	21	Female	Keratocystic odontogenic tumour	Right	Partial	13.0
5	24	Male	Multilocular ameloblastoma	Left	Excised	13.0
6	26	Female	Acanthomatous ameloblastoma	Right	Excised	9.8
7	26	Male	Multilocular ameloblastoma	Midline + left	Excised	14.3
8	27	Female	Multilocular ameloblastoma	Midline	Excised	14.7
9	30	Male	Ossifying fibroma	Left	Excised	15.8
10	33	Female	Odontogenic myxofibroma	Left	Partial	16.0
11	37	Male	Multilocular ameloblastoma	Right	Partial	17.0
12	39	Male	Ossifying fibroma	Left	Partial	16.8
13	51	Male	Multilocular ameloblastoma	Right	Partial	17.0

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