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Experiences with Intra-oral Partial Resection and Simultaneous Reconstruction in Cases of Mandibular Osteomyelitis

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Summary

A review of the surgical treatment of 17 cases of mandibular osteomyelitis is presented in which, following certain special indications, resection and simultaneous reconstruction of parts of the mandible were performed. This treatment was successful in 15 of the 17 patients considered. In two cases, the necrotic graft had to be removed. In one of them, the immediate reconstruction was successfully repeated. The indications for immediate reconstruction are given and the principles of the procedure described.

Key-Words: Osteomyelitis of the mandible, Bone transplantation; Immediate reconstruction of mandible.

Introduction

Today, the treatment of choice, in secondary chronic mandibular osteomyelitis is usually decortication (*Mowlem* 1945, *Obwegeser* 1960, *Becker* 1964, *Trauner* 1964, *Hjoerting-Hansen* 1970, *Tillmann* 1971). According to *Obwegeser* (1976), decortication is also the treatment of choice in acute osteomyelitis of the mandible. However, if this treatment is unsuccessful, or spontaneous fracture has already occurred, or if infected pseudarthrosis is present, resection of the affected part must be considered.

In 1959 *Obwegeser* (1960) carried out successful simultaneous resection and reconstruction of the acute osteomyelitic mandible. Since then, this procedure has been performed on 17 occasions at the Clinic for Maxillo-Facial Surgery in Zurich. The results obtained, using this method are presented in this paper.

Clinical Material

In these 17 patients with destructive osteomyelitis of the mandible the aetiology varied from that of dental origin to infected cysts, trauma,

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infected bone grafts and one from an infected ossifying fibroma *(Tab. 1)*. Spontaneous fracture had occurred in 5 cases. In 3 cases, decortication had been unsuccessful; in another 3 cases sequestrae had been removed on several occasions. The average age of the patients was 47, the youngest being 17, the oldest 74 years of age. There were 5 females and 12 males.

Table 1 Aetiology of mandibular osteomyelitis.

Aetiology	Number of patients
Dental infection	7
Infected cysts	3
Infected ossifying fibroma	1
Post-traumatic	3
Infected bone graft	3
Total	17

Treatment

Prior to admission the patients were treated by their general practitioners with antibiotics. If no antibiogram had been performed, the usual treatment in our clinic was a combination of Bactrim Tabs. 2 every 12 hours and Erythrocin 500 mg 8 hourly, starting 24 hours before operation.

The operative procedure was that described earlier by *Obwegeser* (1960, 1963, 1965a, b, 1966). It is carried out intraorally, even if disarticulation is required. The intraoral incision line always includes existing intraoral fistulae, if they are near the planned incision. Extraoral fistulae were not excised because they were not epithelialized and therefore excision was unnecessary. The amount of bone involved in the resection could not be estimated from the X-rays because the extent of infected bone marrow was not shown. The amount of bone to be resected can only be determined during the operation. Resection was carried out in the area where an initial lateral bone cut through the cortex showed normal bleeding.

Granulation tissue was removed using a periosteal elevator.

The following principles are considered essential for successful resection and simultaneous reconstruction in cases of mandibular osteomyelitis:

1. Resection is always subperiosteal, unlike the procedure in some cases of benign tumours, and particularly in malignancies.
2. The grafted rib or iliac crest bone should contain a minimum of cortex.
3. Large cancellous contact areas between graft and stump should be achieved by complete decortication with cancellous "mush" placed between the two. This apposition should be made under pressure. Alternatively, an inlay technique for adaptation of the graft to the stump can be used.
4. Dead space in the graft area must be avoided by accurate adaptation of the soft tissues to the bone graft by means of subcutaneous sutures running over or around the graft from the lingual to the buccal side, or sometimes through bur holes in the graft. Resorbable suture material must be buried in the depths of the soft tissues. Such adaptation of the soft tissues around the graft is often best achieved with the use of subcutaneous stitches. If adaptation is not attained, dead spaces are best filled by pieces of autogenous cancellous bone.
5. Before tissue closure, a transcutaneous vacuum drain is placed at the lower end of the graft without putting the system under constant vacuum. Secretion is allowed to flow by pushing a large injection needle through the rubber lid of the bottle. A vacuum is applied 3 times during each 24 hours for a period of 5 to 10 minutes only. The drain is removed after several days, only after drainage has ceased.
6. Closure of the incision line must be meticulous. This is achieved by tissue eversion using a horizontal martress suture (Supramid 2–0) reinforced by an overlying continous suture (Supramid 4–0).
7. Whenever possible, intermaxillary fixation should last for about 6 weeks.

Results

In 7 cases, mandibular reconstruction was carried out using rib grafts and in 10 cases by means of iliac crest. Disarticulation had to be

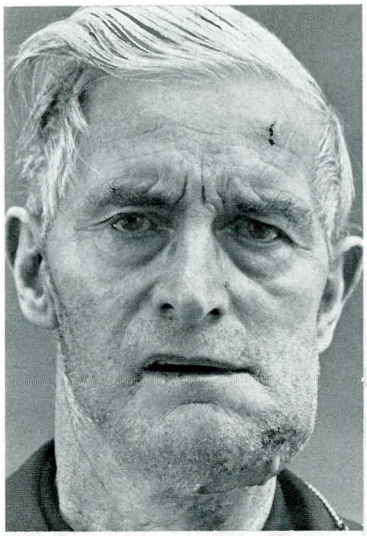


Fig. 1 a

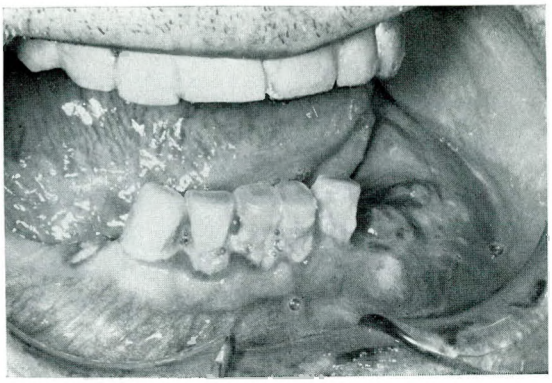


Fig. 1 b

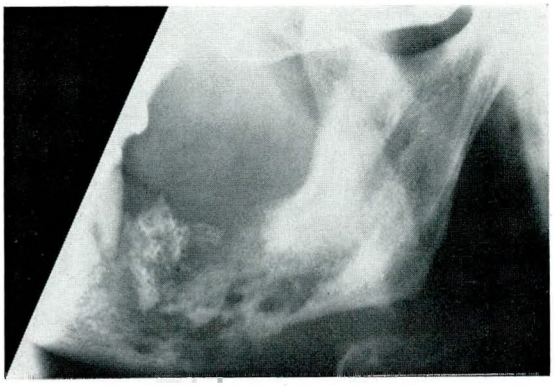


Fig. 1 c

Fig. 1 a–c Treatment of destructive mandibular osteomyelitis: a + b) 70-year-old patient with osteomyelitis of dental origin, which on admission presented multiple extra- and intraoral fistulae. c) The X-ray (lateral oblique projection) shows a spontaneous fracture and complete destruction of the whole body of the mandible.

performed in 6 cases. The largest defect reconstructed was 11 cm, the smallest 1.5 cm, the average was 6 cm. The non-excised extraoral fistulae healed within a few days, without further discharge or suppuration after the first postoperative day. In 15 out of 17 patients, the grafts took without complication. Examples are given in *Figs. 1 to 4.*

In 2 patients, osteomyelitic destruction of the graft required removal. In one of them, the infected bone was removed and immediately replaced by a rib graft; there were no further complications. In the other case, reconstruction could not be repeated because of bronchial asthma.

In addition to this loss of 2 grafts, we also had 2 cases of pseudarthrosis. In one case, a fracture of the middle of the rib graft occurred 8 weeks postoperatively and almost complete resorption followed without infection. In the other case, a pseudarthrosis developed in the area of the anterior stump of the rib graft. This followed normal primary healing and resulted from an ill-fitting provisional denture which had caused a deep pressure ulcer which extended down to the bone in the affected area.

Discussion

Compared with our previously published series of tumour cases (*Sailer* 1974), in which intraoral mandibular resection was accompanied by simultaneous reconstruction, no striking difference is found as far as cases with ordinary osteomyelitis are concerned. Because of the small number (17 patients), the different conditions in each case, and the use of 2 different types of bone (iliac crest and rib), it is not reasonable to do a statistical evaluation. But from the clinical point of view, healing, behaviour of the graft and subsequent function is identical with non-infected cases. A possible explanation might be that the infected mandibular bone in an other-

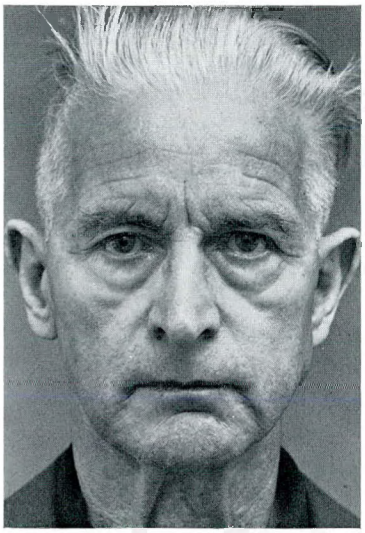


Fig. 2a



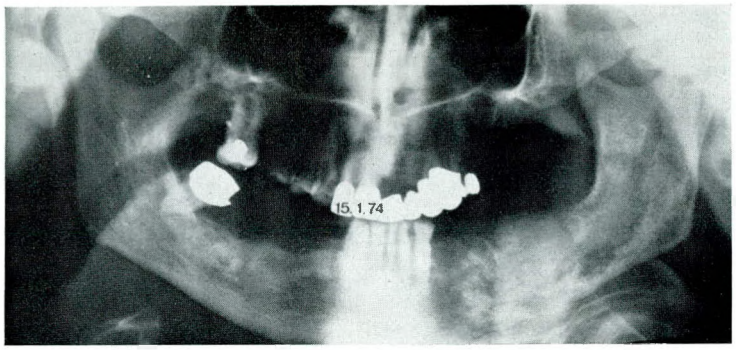
Fig. 2b

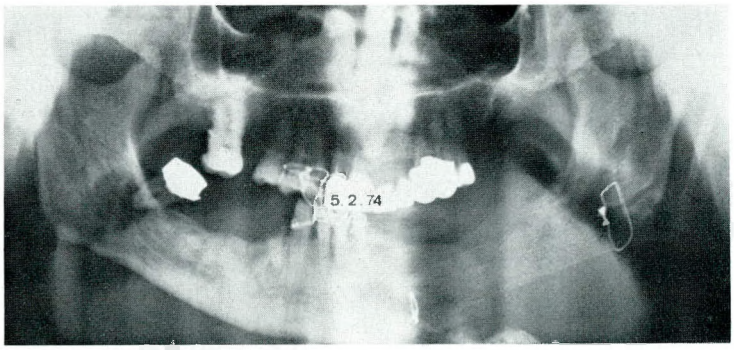
Fig. 2a + b Postoperative appearance of the patient. a) The patient 4 months postoperatively. b) Condition of the buccal soft tissues 14 days after the operation. The fistulae, which were not treated by excision and suturing, healed several days after the intervention.

wise healthy patient causes an inflammatory response from the surrounding soft tissues and leaves, after the removal of the focus, the tissues in an already prepared state of highly anti-infections potential. This would explain the immediate closure of the extraoral fistulae within several days, without any discharge after the first postoperative day. After removal of the necrotic bone, the established defence mechanism appeares to be able to eliminate the rest of the micro-organisms before infection of the grafted bone can occur.

No comparable series is described in the literature, but the approach of our clinic (*Obwegeser* 1960, 1963, 1965a, b, 1968) is supported by a similar procedure by *Luhr* (1973) and *Luhr* and *Ehmann* (1976) who replaced the resected part of the mandible simultaneously via the extraoral route in cases of osteomyelitic pseudarthrosis using a block of cancellous iliac crest bone. They achieved stabilization by the use of a bridging compression plate. A very similar method was used by *Koshla* (1970, 1973). In cases of resection and simultaneous reconstruction, he used plates together with a block bone of or a vitallium mesh lined with a millipore filter, together with bone marrow. *Becker* (1964) describes an interesting case in which he reconstructed the whole ramus and distal body of the mandible immediately after resection. He achieved bony union of this graft to the still osteomyelitic remainder of the body of the mandible. *Becker* (1967) recommends the preservation of the mandibular nerve in cases of resection and simultaneous reconstruction of the osteomyelitic mandible.

The conservative method of treatment of cases of osteomyelitis with spontaneous fractures takes a long time to achieve a satisfactory result, using intermaxillary fixation and antibiotics. When necessary, sequestrectomies are carried out, followed hopefully, by bone regeneration and reunion. An alternative method of treatment would be resection of the affected part and reconstruction later at a second operation when the infection has disappeared. The disadvantage of such a two-stage procedure is the mobility involved. The patient is unable to work or chew properly during this period. Another complication is the enormous scar formation in the wound bed in infected cases. The dissection of such a graft bed is always extremely difficult and demands deep and somewhat risky excision of the scars. Spontaneous regeneration of the subperiostally resected segment is possible in children and adolescents. Such a case of osteomyelitis was demonstrated by *Heidsieck* in 1964 as recorded by *Francksen* (1958) and *Steinhardt* (1967) in non-infected cases.





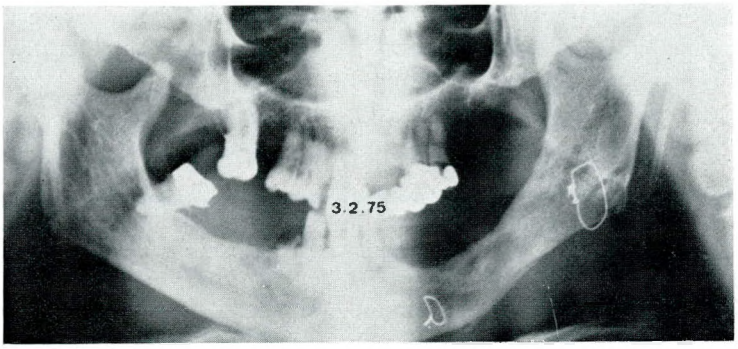


Fig. 3a–c
Radiological sequence of events:
a–c) This series of orthopantomograms shows the radiological course

a) the situation before operation

b) 3 weeks after resection and simultaneous reconstruction with one rib

c) about 1 year postoperatively

Conclusion

In cases of ordinary osteomyelitis of the mandible, intraoral resection and simultaneous reconstruction can be recommended. The extent of resection depends on the clinical findings during operation. The resection line is placed in an area of healthy bleeding bone, indicated by a test cut through the lateral cortical plate.

Indications for such a procedure are:

a) Spontaneous fracture, complete destruction of parts of the mandible and infected pseudarthroses.

b) Failure after decortication.

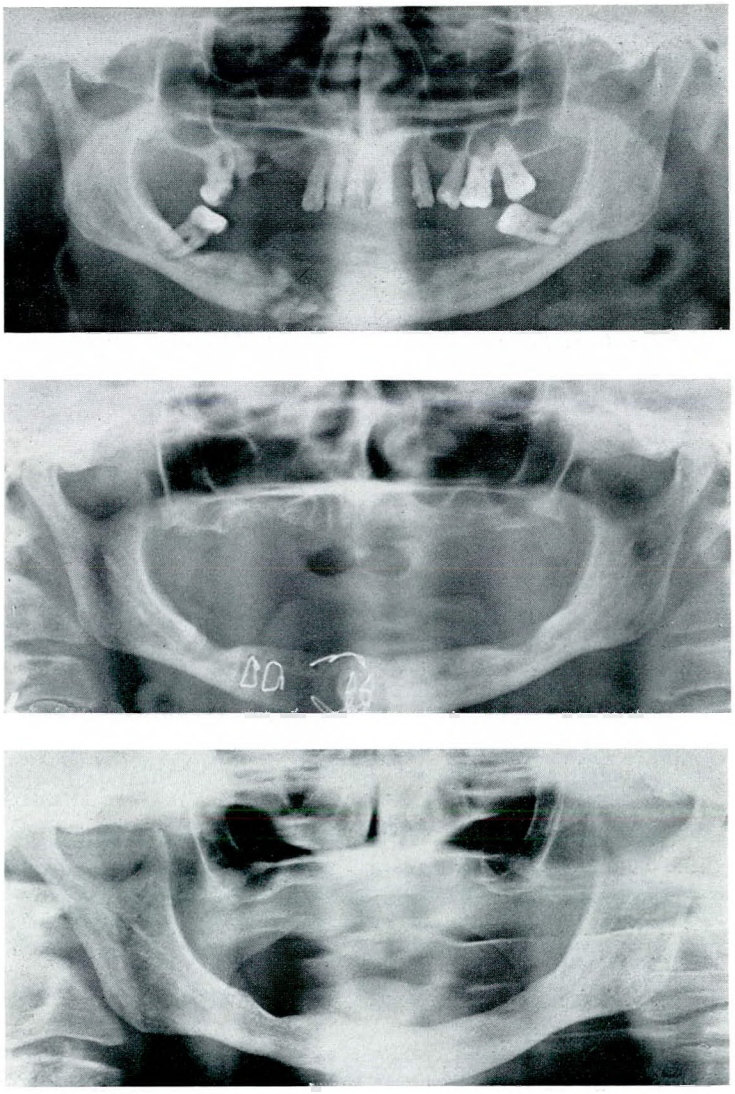
c) Cases in which no decortication is possible, i.e. in which sequestration or sequestrotomies have left a thin and fragile mandible with no tendency to healing.

Non-epithelialized extraoral fistulae are not to be excised; the risk of damaging the facial nerve network is thus reduced.

Acknowledgement

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Fig. 4 a–c
Radiological sequence in another case.



a + b) The series shows the radiological course in a similar case of osteomyelitis and spontaneous fracture which was reconstructed using iliac crest graft; before operation, all the teeth had to be extracted; intermaxillary fixation was not necessary.

c) Shows the situation 1½ years postoperatively.

References

Becker, R.: Therapeutische Konsequenzen aus der Änderung des Krankheitsbildes der Osteomyelitis. In: K. Schuchardt, Fortschr. Kiefer- u. Gesichtschir., Bd. IX. Thieme, Stuttgart 1964

Becker, R.: Zur Therapie der chronischen Osteomyelitis. Dtsch. zahnärztl. Z. 22 (1967) 1020

Francksen, U.: Periostale Regeneration des Unterkiefers nach halbseitiger Exarticulation. In: K. Schuchardt, Fortschr. Kiefer- u. Gesichtschir., Bd. IV. Thieme, Stuttgart 1958

Heidsieck, C.: Zur Problematik der Therapie beim sogenannten Pseudo-Paget. In: K. Schuchardt, Fortschr. Kiefer- u. Gesichtschir., Bd. IX. Thieme, Stuttgart 1964

Hjorting-Hansen, E.: Decortication in treatment of osteomyelitis of the mandible. Oral Surg. 29 (1970) 641

Koshla, U. M.: Immediate bone graft following resection of mandibular osteomyelitic lesion. Oral Surg. 30 (1970) 29

Koshla, U. M.: Current concepts in the treatment of acute and chronic osteomyelitis. Oral Surgery. Transactions of the 4th international conference on oral surgery. Munksgaard, Kopenhagen 1973

Luhr, H. G.: Moderne Verfahren bei der Behandlung der Unterkieferpseudarthrose. Acta traumatol. 3 (1973) 165

Luhr, H. G., G. Ehmann: Differentialdiagnose und

Therapie der chronischen Unterkieferosteomyelitis. Dtsch. zahnärztl. Z. 31 (1976) 787

Mowlem, R.: Osteomyelitis of the jaw. Proc. roy. Soc. Med. 38 (1945) 452

Obwegeser, H.: Aktives chirurgisches Vorgehen bei der Osteomyelitis mandibulae. Oest. Stomat. 57 (1960) 216

Obwegeser, H.: Probleme und Möglichkeiten der Unterkieferresektion und gleichzeitigen Rekonstruktion auf dem oralen Operationsweg. Schweiz. Mschr. Zahnheilk. 73 (1963) 830

Obwegeser, H.: Erfahrungen mit der einzeitigen Unterkieferresektion und -rekonstruktion auf dem oralen Operationsweg. Oest. Z. Stomat. T. 62 (1965) 261

Obwegeser, H.: Operation for primary repair of the lower jaw after tumour resection via the intraoral approach. Exerpta Medica International Congress Series No. 98. Plastic Surgery of Head and Neck Tumours Proceeding First Annual Meeting of the Swiss Society of Plastic and Reconstructive Surgeons, Locarno 1965

Obwegeser, H.: Simultaneous resection and reconstruction of parts of the mandible via the intraoral route. Oral Surg. 21 (1966) 693

Obwegeser, H.: Primary repair of the mandible by the intraoral route after partial resection in cases with and without preoperative infection. Brit. J. Plast. Surg. 21 (1968) 282

Sailer, H. F.: Experiences with intraoral partial resection and simultaneous reconstruction of the mandible in preoperatively non-infected cases. J. max.-fac. Surg. 2 (1974) 173

Steinhardt, G.: Bewährte Operationsmethoden bei „semimalignen" Geschwülsten der Kiefer. Dtsch. Zahn-, Mund- u. Kieferheilk. 49 (1967) 124

Tillmann, K.: Erfahrungen mit der Dekortikation nach Mowlem-Obwegeser bei der chronischen Osteomyelitis. Dtsch. Stomat. 21 (1972) 643

Trauner, R.: Die Osteomyelitis der Kiefer. In: K. Schuchardt, Fortschr. Kiefer- u. Gesichtschir., Bd. IX. Thieme, Stuttgart 1964

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