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Case report

Reconstruction of the bony chin using sagittal split osteotomies of the remaining mandible – A new technique for a special indication: Case report

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ABSTRACT

There are several indications for resecting the bony chin, such as squamous cell carcinoma, sarcoma, or benign tumors of the jaw such as ameloblastoma. Several techniques for reconstruction of the bony chin, such as the use of metal plates and also revascularized free bone grafts of the iliac crest, fibula, or scapula, are common. In the case of poor vascular supply, however, alternative techniques may be necessary. In this report, a new technique is described using pedicled bone flaps from both sagittally split mandibular stumps following chin resection. These flaps were pedicled on the mylohyoid muscles and advanced to restore the continuity of the mandible. An advantage of this procedure was minimization of the soft tissue defect, making repair easier. Morbidity of the resection and reconstruction was thus reduced, and recovery of the patient was very quick.

1. Introduction

Resection of parts of the mandible is often necessary in patients suffering from tumors involving the bone. Sometimes even the continuity of the mandible has to be sacrificed, for example, in the chin area.

This is indicated for malignant tumors such as squamous cell carcinoma or sarcoma as well as benign tumors such as ameloblastoma, or in cases of osteomyelitis, osteoradionecrosis or bisphosphonate related osteonecrosis of the jaw (Lawson and Biller, 1982; Müller and Slootweg, 1985; Slootweg and Müller, 1989; Chana et al., 2004; Ooi et al., 2014; Mücke et al., 2016). In order to prevent the so-called “Andy Gump” deformity (absent chin with retrognathia of the lower jaw), some kind of reconstruction is mandatory (Steckler et al., 1974).

The goal of modern reconstructive surgery in these cases is to provide the patients with functioning dentures not only to optimize speaking and eating but also for esthetic reasons. This is a prerequisite for a normal physical and psychological postoperative life. Thus bone reconstruction is the minimum for realizing this goal (Riediger, 1988); otherwise restoration of the dental occlusion cannot be achieved. Boyd (1997) and Goh et al. (2008) stated that reconstruction of the mandibular branch of the facial nerve, as well as restoration of the lingual, inferior alveolar and glossopharyngeal nerves would also be desirable, just as refixation of the remaining soft tissues to the bone in order to achieve a perfect rehabilitation.

Initially, reconstruction of the continuity of the mandibular bone was performed using only reconstruction plates (Luhr, 1976; Schmoker, 1983; Klotch and Prein, 1987). However, this technique is associated with several problems. There is a high incidence of soft tissue penetration of the metal plates intraorally as well as extraorally (Schusterman et al., 1991) and reoccurring even after covering the plate with a free microsurgically revascularized soft tissue graft (Wei et al., 2003). Prosthodontic rehabilitation of these patients is difficult or even impossible (Boyd et al., 1995). Fracture of the plate especially concerning dentate patients was also a frequent event. Then the fracture site usually was located at the plate–bone interface (Freitag et al., 1991).

Therefore, reconstruction of the chin with bone seems to be more efficient and satisfactory for the patient. However, non-vascularized bone grafts often demonstrated a success rate as low as 46% (Lawson and Biller, 1982). The use of microsurgically vascularized bone grafts, which developed into a sophisticated technique during the past decades, using rib, radius, iliac crest, fibula or scapula, is nowadays accepted as the gold.

Standard to overcome the disadvantages of chin resection and simple metal plate reconstruction (McKee, 1971; Serafin et al., 1977; Soutar et al., 1983; Taylor et al., 1975, 1979; Toet et al., 1981; Swartz

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et al., 1986; Riediger, 1988; Jewer et al., 1989; Hildago, 1989, 1991; Urken et al., 1991; Boyd et al., 1995; Shpitzer et al., 1999; Yoo et al., 2013; Ooi et al., 2014).

However, two preconditions for a successful vascularized bone transfer have to be fulfilled: (1) the general health condition of the patient should allow a longer lasting surgical procedure; and (2) the vascular status of the patient should be sufficient for microvascular procedures (Goh et al., 2008).

In cases in which these conditions are not ideal, reconstruction plates with all the described disadvantages may be indicated, and alternative surgical procedures have not yet been described in the cranio- and maxillofacial literature (Goh et al., 2008).

The following case report will illustrate such an alternative surgical procedure to reconstruct the anterior mandible with pedicled bone flaps from the remaining mandible.

2. Case report

A 68-year-old woman had suffered from an invasive squamous cell carcinoma of the floor of the mouth with deep invasion into the bony chin (Fig. 1a and b). She had smoked 20 cigarettes per day for more than 50 years; her alcohol history was unremarkable. After receiving her informed consent regarding resection of the anterior mandible and explaining to her the planned mandibular reconstruction procedure, the patient accepted the following: wide resection of the floor of the mouth, including the anterior and caudal part of the tongue, plus bone removal anterior to the molar region on both sides, leading to a wide bony chin defect. Furthermore, a bilateral omohyoid neck dissection had to be performed if no lymph node metastases were detected intraoperatively, thus confirming the preoperative tumor formula of T4, N0, M0. Neither reconstruction of nerves like the inferior alveolar, the lingual or the hypoglossal nerve nor reconstruction of the marginal branches of the facial nerve were taken into consideration, because on one hand side this was not standard of treatment and on the other hand positive outcomes of these procedures were considered not to be evidence based. Bony reconstruction with a free vascularized graft appeared to be impossible due to the poor vascular status of the patient.

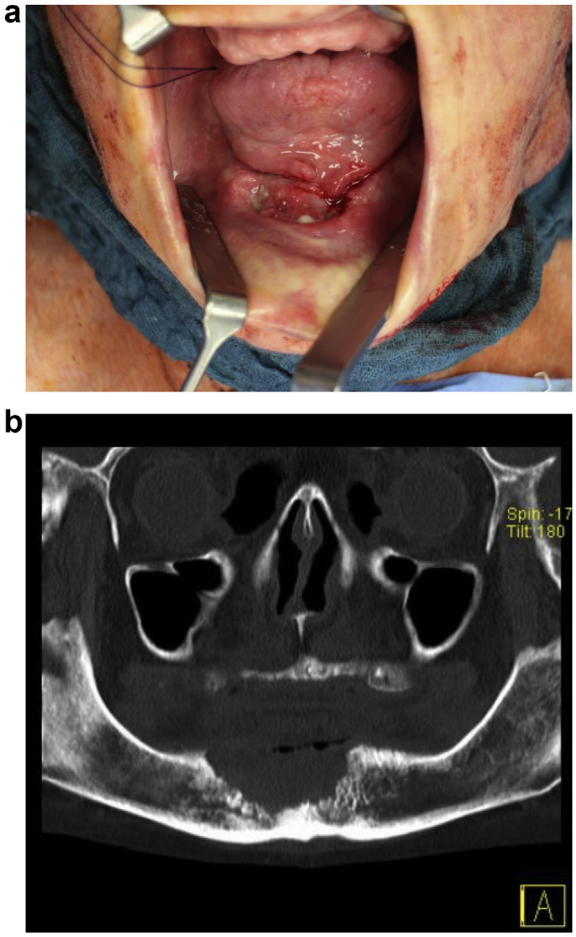

Fig. 1. Deep invasion of the mandible by squamous cell carcinoma of the floor of the mouth. (a) Intraoral view prior to resection. (b) Computed tomogram showing deep bony infiltration by the tumor.

2.1. Surgical repair of the bone

After bilateral omohyoid neck dissection, a reconstruction plate (Medicon: mandibula 2.4, Tuttlingen, Germany) and a miniplate (Medicon: mini 2.0, Tuttlingen, Germany) were fixed transversely dorsally to the planned resection sites of the mandible in order to secure the position of both stumps after tumor resection. Then the mandible was resected between both molar regions (Fig. 2a and b). After intraoperative confirmation of tumor-free resection margins by the pathologist (Dr. V. Groβ), modified Obwegeser-Dal Pont sagittal split osteotomies of both remnants of the horizontal rami of the mandible were performed (Fig. 3). The inner tables of the mandible on both sides were moved anteriorly in order to reconstruct the continuity with these bone flaps being nourished by the remnants of the mylohyoid muscle. In order to achieve a perfect curve of the chin, additional osteotomies of both the shifted and pedicled inner tables were necessary. The bone segments were fixed using miniplates (Medicon: mini 2.0, Tuttlingen, Germany). During this procedure, a small piece of bone was lost at the caudal

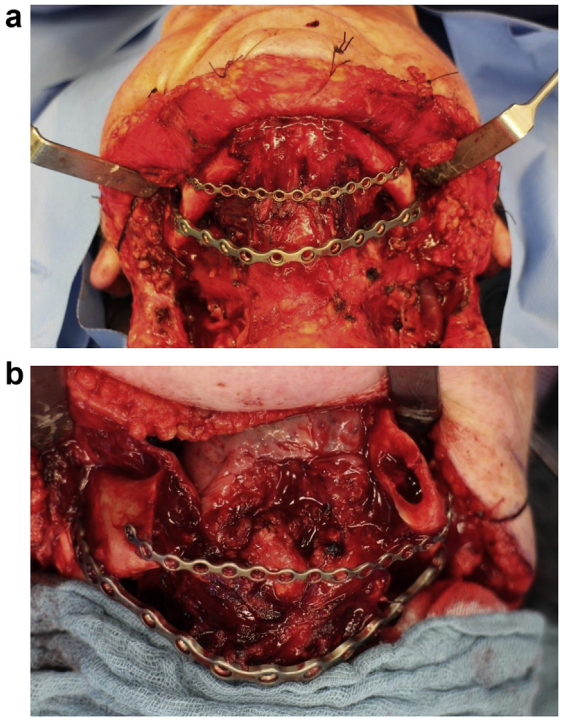

Fig. 2. Intraoperative views showing the position of the titanium plates before and after tumor resection, fixed in a transverse direction not interfering with the resection procedure. (a) Position of the titanium plates before tumor resection. (b) Titanium plates after tumor resection.