Platysma myocutaneous flap - its current role in reconstructive surgery of oral soft tissue defects

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Reconstruction of oral soft-tissue defects following resection of oral carcinomas can be achieved using various techniques including microsurgical tissue transfer. However, there seems to be a role for regional or local flaps. Small to medium-size defects can be functionally reconstructed with the platysma myocutaneous flap as an excellent choice particularly in medically compromised patients not being eligible for free tissue transfer. The present paper reviews the indication, surgical technique, and complications following reconstruction of defects of the oral cavity with the platysma myocutaneous flap.

Key words: Oral carcinoma, Functional reconstruction, Platysma myocutaneous flap, Head and neck neoplasms

I. Introduction

Surgical resection of tumors of the oral cavity and oropharynx will result in severe functional impairment of the individual patient. Therefore adequate functional reconstruction of both hard and soft tissue defects plays a key role in the surgical treatment of head and neck tumors. Nowadays various surgical methods of reconstruction are available, including primary closure of mucosal defects, skin grafting, tongue flaps, pedicled myocutaneous island flaps, and free flaps. During the last three decades tremendous progress has been made in head and neck reconstructive surgery by introducing microvascular free tissue transfer from various donor sites for restoring extensive defects in the head and neck area[1,2]. However, as most patients with head and neck tumours often have medical comorbidities a proper and critical preoperative assessment of the risk of postoperative complications is essential before such patients are selected for extensive oncological and reconstructive surgery[3-5]. Therefore pedicled flaps might be indicated in specific cases resulting in comparable functional outcome[6].

Pedicled myocutaneous flaps such pectoralis major flap, latissimus dorsi flap, trapezius flap also have a long tradition in head and neck reconstructive surgery, but they have been left for specific cases. Historically the use of the platysma myocutaneous flap can be traced back to 1887, when Robert Gersuny[7], a surgeon from Austria described a reconstruction of a full-thickness cheek defect with a cervical skin/platysma flap which was rotated inward to provide a new lining for the buccal mucosa. This was probably the first description of the platysma myocutaneous flap used for head and neck reconstruction. However, it was not until 1978 that the platysma myocutaneous flap was introduced by Futrell et al.[8] as an attractive reconstructive option with several advantages. Reviewing the literature shows large variety of indications to use the platysma myocutaneous flap for reconstruction of defects of the anterior floor of mouth, tongue, cheek, oropharynx, and facial skin[9-32].

Detailed anatomic studies decribed the vascular anatomy with the submental artery as the predominant blood supply to the platysma muscle as well as to the skin paddle[33-35]. Apparently the issue of sacrificing the facial vessels is critical as far as flap survival is concerned, although there is some debate on this matter[11,15,18]. McGuirt et al.[11] and Ruark et al.[15] have stated that preservation of the facial artery is not a

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prerequisite for survival of the platysma myocutaneous flap.

As the flap can be either used superiorly or posteriorly-based, it can provide an adequate amount of pliable soft tissue that is sufficient for reconstruction of small to medium-sized skin or mucosal defects of the facial skin, oral cavity, and pharynx[36]. The platysma myocutaneous flap can be easily harvested and has low donor site morbidity, but has not gained widespread acceptance among head and neck surgeons because of problems with flap vascularity. There is still some reluctancy to use the flap in view of reported flap-related complication rates in the range of 10-45%[9,11,15,18,20,25,37]. Loss of skin paddle or formation of orocutaneous fistula have been described as main problem due to ischemic flap failure or venous congestion[20]. Both arterial supply and venous drainage may be compromised during surgical dissection, as well as by previous neck dissection, scar formation, or previous radiotherapy[18].

Although microvascular free tissue transfer using various donor sites is an established routine procedure for the majority of oncologic head and neck defects, the use of the platysma myocutaneous flap has been incorporated as a valuable alternative at our institution for selected indications. For medically compromised patients the platysma flap can be recommended as first choice with a predictable functional outcome[12,38]. This report aims to illustrate clinical experience of intraoral soft tissue reconstruction with the superiorly pedicled platysma myocutaneous flap in a large number of oncologic patients and to critically review the existing literature on this topic.

II. Patients and Methods

From 2004 to 2012, 45 patients received a platysma myocutaneous island flap in a single stage procedure at the Department of Cranio-Maxillofacial Surgery, Hannover Medical University. The patient population consisted of 31 men and 14 women, with a mean age of 61.4 years (range 39 to 84 years). Except for one patient with chronic osteomyelitis and intraoral bone exposure, the majority of patients (n=41) were diagnosed with squamous cell carcinoma of the oral cavity. Three patients were diagnosed with carcinomas of minor salivary glands. All tumors were located in the oral cavity. Areas of resection included the anterior and lateral floor of mouth, tongue, and retromolar trigone. Primary tumor resection was combined with selective neck disssection level I-III ipsilateral or bilateral if indicated. Adjuvant treatment included postoperative radiotherapy in 3 patients (6.8%). No preoperative chemotherapy or chemoradiation was administered.

1. Surgical technique

Before flap harvesting the anticipated intraoral defect is measured. The outline of the platysma flap is initially made as an ellipse with the inferior margin low in the neck above the clavicle. Typically the dimensions of the skin island are 6 ×10 cm the maximum. If a standard apron-type flap is raised for a neck dissection, the inferior margin of that flap will be

Fig. 1. The intraoperative site with incision of the skin island during harvesting of a cranially pedicled platysma myocutnaeous flap.
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Fig. 2. Following an apron-type incision a skin flap will be dissected up to the mandible leaving the platysma muscle with the skin island down.
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Fig. 3. Intraoral view of a cT2 carcinoma of the left lateral tongue border in a 75-year old woman (A). Intraoperative site following transoral resection of the carcinoma (B). A pedicled platysma myocutaneous flap is dissected (C) and rotated superiorely in to the intraoral defect of left tongue (D). Intraoperative site immediately after defect coverage of the left tongue border shows well vascularised pedicled platysma flap (E).

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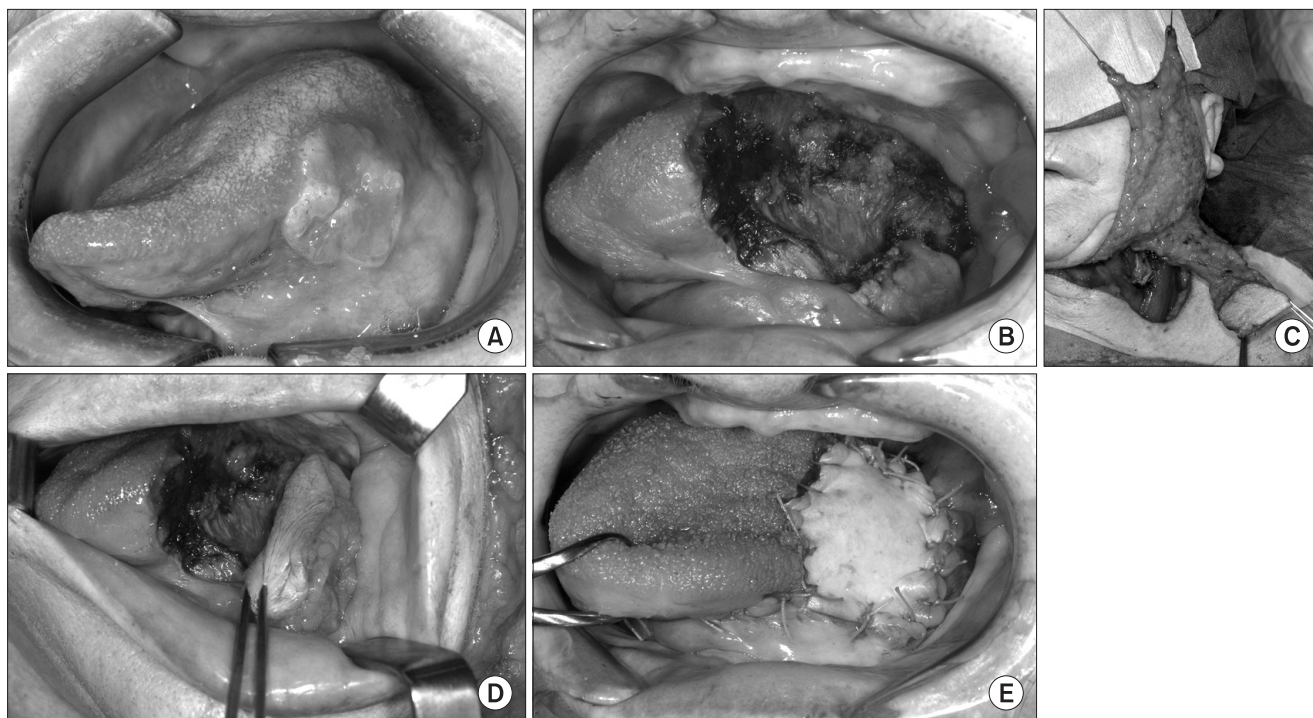

Fig. 4. Cervical skin with acceptable scar of the lower neck one year after surgery.

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Fig. 5. Intraoral situation one year after reconstruction using platysma myocutaneous flap with well vascularised skin island and unrestricted tongue mobility.

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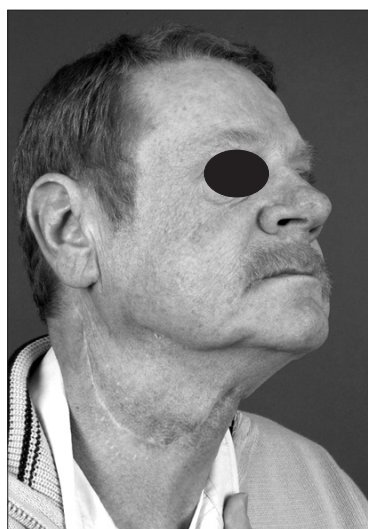
the inferior margin of the platysma flap.(Fig. 1) The inferior skin incision will be made through the platysma muscle, whereas the superior skin incision will pass only the skin. Subs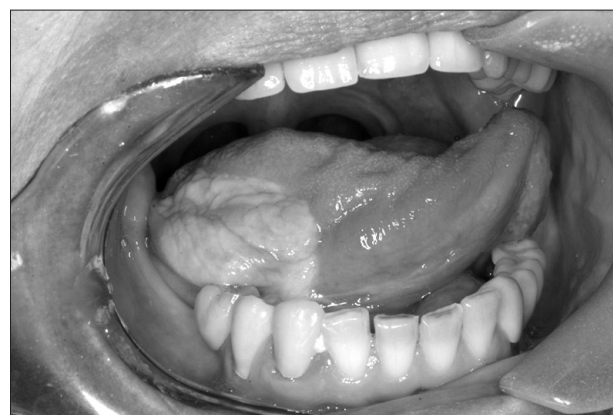equently a skin-only flap will be raised superior to the skin paddle up to the mandible, leaving the platysma down. (Fig. 2) Whenever feasible the flap pedicle covered the full width of the platysma muscle at least 4 cm. The plane of elevation should include the sternocleidomastoid fascia, as well as the external jugular vein to provide adequate venous drainage. After tumor resection and neck dissection, the

platysma myocutaneous flap is rotated superiorly and 180 degrees into the intraoral defect and sutured into position. (Figs. 3. A-E) During rotation care must be taken to avoid excessive stretching, compression, or twisting of the flap pedicle. To avoid compression a sufficiently wide tunnel under the mandible should be dissected before the flap is rotated into the intraoral defect area. The neck incision is closed primarily. A long-term follow-up at 1 year shows an acceptable scar in the lower neck without any functional impairment.(Fig. 4) Intraorally the skin paddle has healed in without problems and allows for adequate tongue mobility.(Fig. 5)

III. Results

The patient population was evaluated for immediate and delayed postoperative complications, with follow-up ranging from 6 months to eight years. The tumors consisted of squamous cell carcinoma of the oral cavity in 88% of the cases (n=40) and the oropharynx in 2.3% (n=1). In 3 patients (6.8%) tumors were diagnosed as salivary gland carcinomas (adenoid-cystic carcinoma n=1, mucoepidermoid carcinoma n=2). Tumor size ranged from pT1 to pT4 (pT1: 26 (59%), pT2: 11 (25%), pT3: 1 (2.2%), and pT4: 3 (6.8%). There were 3 patients (6.8%) diagnosed with pTis. The nodal status was as follows: pN0 39 (88.6%), pN1 3 (6.8%), and pN2b 2 (4.5%). With regard to the anatomical site the floor of mouth was involved in 20 patients (44.4%), the cheek in 4 patients (8.9%), the tongue in 11 patients (24.4%), the alveolar crest in 8 patients (17.8%), and the oropharynx in 1 patient (2.2%). The size of the skin island varied in size from 3×5 cm to 5×7 cm. Flap harvesting was performed from one side of the neck in 43 patients (95.6%), a bilateral platysma flap was raised in 2 patients (4.4%). In all patients the reconstruction was performed as a single-stage procedure together with tumor resection using a transoral/transcervical approach. In 6 patients (13.3%) mandibular continuity resection with immediate alloplastic mandibular reconstruction using titanium 2.4 mm reconstruction plates was performed.

Selective neck dissection (level I-III) was performed in 44 patients (97.8%), as an ipsilateral procedure in 27 patients (61.3%) and as bilateral procedure in 14 patients (31.8%). The donor site was closed primarily and resulted in a good cosmetic result in the neck. Flap complications were noted in 4 patients (8.9%) with total flap loss in 3 patients (6.6%). Partial flap loss was managed by local measures, such as surgical wound debridement of necrotic tissue. A total of 4 patients (9%) developed tumor recurrences 6 months to

1 year after the primary resection. These patients received salvage surgery and adjuvant chemoradiation. However, 3 of these patients developed progressive disease after salvage treatment and died of their disease.

IV. Discussion

A major goal of oral and facial reconstruction after tumor resection is to restore adequate form and function thereby improving patients quality of life. During the last five decades important milestones in head and neck reconstructive surgery have been achieved including regional pedicled flaps and of course microvascular free tissue transfer. According to the literature pedicled flaps are mostly reserved for medium-sized defects or as a salvage option for tumor recurrences[6]. The platysma myocutaneous flap is a pedicled cervical flap initially described by the Austrian surgeon Gersuny[7] in 1887; however this type of pedicled flap was then neglected for a long time before being introduced for intraoral soft tissue reconstruction by Futrell et al.[8] in 1978. This flap is an attractive reconstructive option and offers several advantages: it is thin and pliable with no excessive bulk and easy to harvest. The near location to the oral cavity allows for reconstruction of various intraoral areas such as floor of mouth, tongue, pharyngeal wall[9-12,14-17]. Despite these advantages the platysma myocutaneous flap has not gained widespread acceptance most probably due to a lack of its reliability and a high rate of complications (18-45%). The flap complications rate in our series was 8.9% with a total flap loss rate of 6.6% which is comparable to

Table 1. Complication rate of platysma myocutaneous flap reported in selected case studies

Author	No. of patients	Rate of flap loss (%)
Futrell et al.[8]	14	7.1
Cannon et al.[10]	22	16.7
Coleman et al.[9]	24	29.6
Ozgen et al.[16]	4	25
Ruark et al.[15]	41	7.3
Esclamado et al.[25]	12	8.3
Ozçelik et al.[27]	20	0
Verschuur et al.[18]	44	2.3
Koch[17]	34	17.6
Peng et al.[36]	48	6.25
Grützenmacher et al.[23]	25	12
Pagani et al.[21]	10	20
Puxeddu et al.[22]	11	0
Wang et al.[24]	10	0
Koch et al.[20]	70	10
Tosco et al.[19]	91	13

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reported flap loss rates in larger case series.(Table 1) Szudek and Taylor[37] reported a flap complication rate of 33.7% in their meta-analysis including a total of 190 patients from 16 published reports. They further concluded that postoperative complications were not associated with age, sex, or preoperative radiotherapy, but were associated with recipient site and tumor stage[37]. Verschuur et al.[18] and Szudek and Taylor[37] reported a failure rate with total flap loss of 2.5-5.0%. A meticulous dissection technique with attention to the specific vascular supply of the platysma flap can avoid such complications as pointed out by Hurwitz et al.[33].

Relative contraindications to harvest the platysma flap are facial artery ligation, prior radiation or neck dissection. These factors are probably associated with impaired postoperative perfusion and were thought to be responsible for an increased flap failure rate. The blood supply of the platysma myocutaneous flap is extensive with the primary supply coming from the submental artery which branches from the facial artery. Additional supply comes from the transverse cervical, thyroid, occipital and posterior auricular vessels[39]. The venous drainage is critical to this flap and, therefore, tension or compression should be avoided. The venous drainage pattern is vertical and the flap is more likely at risk due to venous congestion than arterial insuffiency[38]. We agree with authors such as Ruark et al.[15] and Verschuur et al.[18] that the external jugular vein should be preserved and included in the flap pedicle whenever possible. Previous radiotherapy to the neck seems to be a relative contraindication for the platysma flap, although there is no conclusive evidence. In our series only 1 patient (2.2%) had previous radiation to the neck and developed no postoperative complications. Similarly Cannon et al.[10] didn't observe any major complication in their series in which 5 patients received radiation with doses of 43 Gy or more.

There is controversy about the survival of the superiorly-based platysma flap when the facial artery has been ligated. Unfortunately not all studies provide details of the site of facial artery ligation or if was ligated at all. Coleman et al.[9] emphasized that the platysma flap cannot be raised in standard radical neck dissection because the facial artery is transsected which compromises flap survival. In contrast McGuirt et al.[11] found that only 1 in 20 patients with facial artery ligation had partial loss of the skin paddle. The flap did also well in patients in spite of preoperative radiation or previous neck dissection. McGuirt's clinical observations are supported by the detailed anatomical studies performed by Hurwitz et al.[33] who came to the conclusion that an intact

facial artery is not crucial for survival of the platysma flap. Interestingly, some studies have emphasized that the success also depends on careful preoperative patient selection and careful surgical technique[12,15,17,18]. In their review Szudek and Taylor[37] reported a success rate of 95% in 190 patients. This is comparable to success rates of free tissue transfer being in the range of 91-99%[1-3]. Intraoperative situations such as an extended radical neck dissection with multiple vessel ligations must be included in the surgical planning[11,18,25]. We would agree with Tosco et al[19]. that the main contraindications to use the platysma myocutaneous flap are previous surgical scaring or previous neck radiation therapy, the need of tissue bulk in the defect zone, defect size larger than 7×10 cm, and when there is radiologic suspicion or evidence of neck metastases with extracapsular spread.

V. Conclusion

Although free tissue transfer has gained widespread acceptance as a standard technique for restoring extensive oncological defects in the head and neck region, pedicled regional flaps such as the platysma myocutaneous flap should not be neglected since they are a valuable alternative for smaller to medium size defects and particularly useful in medically compromised patients. Watchful observation of indications and contraindication together with careful patient selection are crucial factors to be considered in the surgical planning process. Taking the mentioned contraindications and limitations into account, the platysma myocutaneous flap is an elegant and attractive reconstructive option for a variety of intraoral locations and should be included in the repertoire of any cranio-maxillofacial surgeon involved in the surgical treatment of oral and oropharyngeal malignancies.

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