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Failure of pedicled flap reconstruction in the head and neck area: A case report of a bilateral subclavian artery stenosis

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ABSTRACT

INTRODUCTION: Pedicled flap reconstruction still plays an essential role in head and neck surgery as an alternative to free grafts. Two standard methods are the pectoralis major and the deltopectoral flap, which are generally characterized by their reliable perfusion. This case describes bilateral arteriosclerosis of the subclavian artery as a possible cause of flap failure.
PRESENTATION OF CASE: We report on a 65-year-old patient with a multilevel carcinoma of the right pharynx. Due to the unique patient history, a free flap reconstruction was not possible. After resection of the primary, we performed reconstruction with a pedicled pectoralis major flap.
DISCUSSION: Postoperatively, we observed necrosis of the pectoralis major flap. Secondary defect reconstructions were performed with a deltopectoral flap first from the right and then, in the case of necrosis, from the left side. Stenosing arteriosclerotic plaques of the subclavian artery on both sides were the cause of flap failure.
CONCLUSION: Preoperative angiography of the subclavian artery is not a standard diagnostic procedure in the surgical planning of pedicled flap reconstruction in the head and neck region. In exceptional cases, we recommend angiographic imaging of the supplying vessels to make a more precise flap selection and avoid complications.

1. Introduction

This case report is in line with the SCARE guidelines and PROCESS criteria for surgical case reports [1,2]. Pedicled or free flaps play an essential role in reconstructive surgery of the head and neck area. After tumor resection, trauma, or rare malformations, they facilitate defect reconstruction if primary wound closure is impossible for functional or esthetic reasons [3]. Free microvascular flaps are the current standard in reconstructive head and neck surgery [4]. Nevertheless, pedicled flaps still play an essential role as an alternative in reconstructive surgery today [5,6]. Two of the most common pedicled grafts are the pectoralis major and the deltoid pectoral flap. Both are highly reliable with the constant anatomy of the supplying vessels [7]. Therefore, they are suitable for reconstructing patients with low vascular status and tissue damage by irradiation [5]. The vascular supply of the deltopectoral flap is provided by the first 3–4 perforating vessels of the internal mammary artery. The fasciocutaneous graft includes an area extending from the upper anterior chest wall and clavicle to the deltoid muscle and shoulder. Due to the broad base and the limited length, the application is mainly limited to reconstructing the outer head and neck defects. It can also be used to reconstruct the pharynx when other flaps are not available [8]. The supplying vessels of the pectoralis major flap originate from the thoracoacromial artery. They run along the underside of the pectoralis major muscule's and release numerous perforators to the skin. The long pedicle enables defect coverage in the outer head and neck area and the upper respiratory and digestive tract [7,9]. We present a case from an academic tertiary referral center that showed a very critical situation of multiple pedicled flaps used for defect closure of the pharynx.

2. Presentation of case

The 65-year-old male white patient presented with progressive odynophagia, dysphonia, and mild dysphagia with a weight loss of approximately 5 kg during the last six months. Pharyngoscopy showed an exophytic mass of the hypopharynx's right lateral wall with a vocal fold arrest on the right side. The patient's history showed several different diseases, such as a peripheral arterial occlusive disease (POD) of the left leg with the condition after stent

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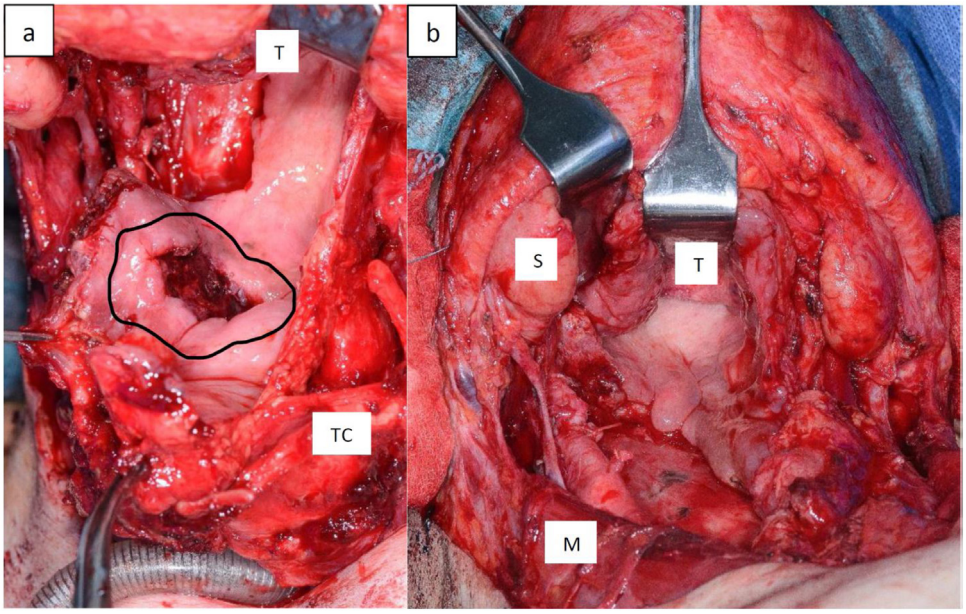

Fig. 1. Tumorresection with laryngectomy, partial pharyngectomy, and bilateral modified radical neck dissection.
(a) Tumor mass of the right pharynx. The tumor infiltrates the thyroid gland, the piriform sinus, the larynx, the hyoid bone, the tonsil on the right side and the dorsal pharyngeal wall; (b) resection defect. T = Tongue; TC = Thyroid cartilage; S = Submandibular gland; M = Sternocleidomastoid muscle.

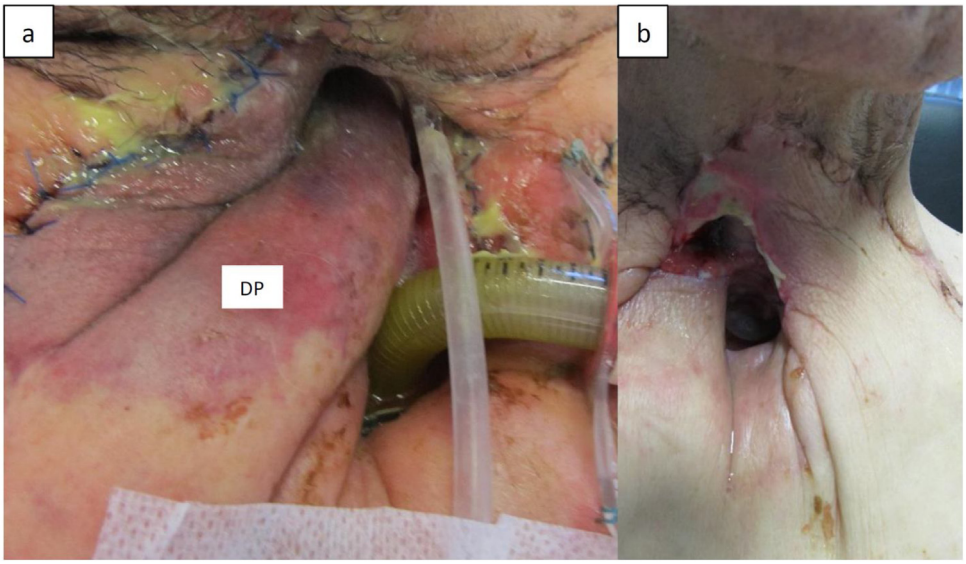

Fig. 2. Critical situation of pedicled flaps.
(a) Flap necrosis in the cranial part of the right sided deltopectoral flap after applying a pharyngostoma on the right side; (b) Defect closure of the suprastomal fistula with a deltopectoral flap from the left side. Tissue necrosis of the right and cranial graft portion.

implantation of the common iliac artery—a multilevel type POD of the right leg with the state after aortoiliac bypass. Additionally, hypertension, nicotine abuse (45 pack-years), and a condition after bilateral distal radius fracture with multiple surgeries and plate osteosynthesis were reported. There were no clinical symptoms indicating stenosis of the subclavian artery.

We performed a panendoscopy with biopsy, contrast-enhanced CT scan of the neck, thorax, abdomen, and B-scan ultrasonography for tumor staging. We suspected a cT4a cN2c cM0 carcinoma of the right pharynx. Besides, imaging revealed arteriosclerotic vascular plaques in the carotid bifurcation on both sides. A histologically poorly differentiated, non-keratinizing squamous cell carcinoma was confirmed (G3). Due to the large tumor volume and the extensive cartilage invasion, we recommended surgical therapy in the pre-therapeutic interdisciplinary tumor board, despite the poor vascular situation. Besides, both radial arteries were damaged by trauma, which excludes defect reconstruction via a radial forearm flap. The definitive tumor therapy follows with a laryngectomy, partial pharyngectomy, and bilateral modified radical neck dissection (Fig. 1). We performed defect reconstruction with a pectoralis major flap from the right side and a voice prosthesis (Provox®). The surgery was performed by two highly experienced surgeons. After receiving the final histopathological report, the postoperative diagnosis was: pT4a pN2b (4/39, without extranodal extension) cM0 L0 V0 Pn0 G3. All margins were free (R0). We performed thrombosis prophylaxis with Clexane 40 mg daily.

Postoperatively, necrosis of the pectoralis major flap at the upper part with wound dehiscence in the oropharyngeal region

Fig. 3. Final result after completed wound healing (one year after surgery).

appeared. The swallowing examination confirmed a pharyngeal fistula on day ten, postoperatively. The same experienced surgeons performed necrosectomy and defect reconstruction, using a deltopectoral flap from the right side and applying a temporary pharyngostoma. The thoracic wall at the donor site was covered via a mash graft from the right thigh. On the fifth postoperative day, the superior part of the deltopectoral flap was lividly discolored (Fig. 2a). In the further course, tissue necrosis with epidermolysis results in dehiscence at the inferior flap margin above the tracheostomy. Six weeks after conservative wound management and concomitant antibiotic therapy, the same surgeon team performed pharyngeal closure via a deltopectoral flap from the left side. On the 10th postoperative day, a livid discoloration of the right peripheral flap margin occurred but did not continue proximally towards the flap's base (Fig. 2b).

We performed further wound management, including consequent removal of necroses, freshening of the wound margins, and insertion of granulation-promoting wound material. After an additional six weeks, nutrition was entirely oral with satisfying swallowing function. The speech prosthesis was handled very well. The cosmetic result was quite acceptable so that the patient has regained a high level of quality of life as shown in Fig. 3 one year after surgery.

As part of the regular follow-up, we performed a CT scan of the neck and thorax without recurrence evidence. However, we could identify the stenosis of the subclavian artery in the proximity of its outlets on both sides of the neck, responsible for flap failure (Fig. 4).

3. Discussion

The subclavian artery's preoperative angiography is not a standard procedure in the surgical planning of pedicled flap procedures in the head and neck area. This case shows that a closer examination of the vascular situation of the vessels supplying the graft, or an extended diagnosis by angiographic imaging of the vessel branches, can influence suitable flap selection. Despite the low rate of total flap loss of 0.6–2.7% [10–12] for the pectoralis major and deltopectoral flap described in the literature, repetitive complications have occurred. The total failure of the pectoralis major and deltopectoral flap on the right and the partial necrosis of the deltopectoral flap on the left was caused by both-sided stenosis subclavian artery. Due to prolonged wound healing, we did not apply adjuvant therapy. In a time frame of 6 weeks after surgery, the implementation of adjuvant chemoradiation was recommended due to tumor size, lymph node metastases, and grading to reduce recurrence risk [13]. With the knowledge of the poor vascular condition, the primary application of a pharyngostoma or the reconstruction of the defect with an alternative flap could have prevented complications that led to wound healing disorders and, ultimately, to the abandonment of adjuvant therapy. The cranially pedicled platysmal flap is a possible reconstruction method for pharyngeal defects, but it was not considered in this case due to the size of the defect [14]. As an

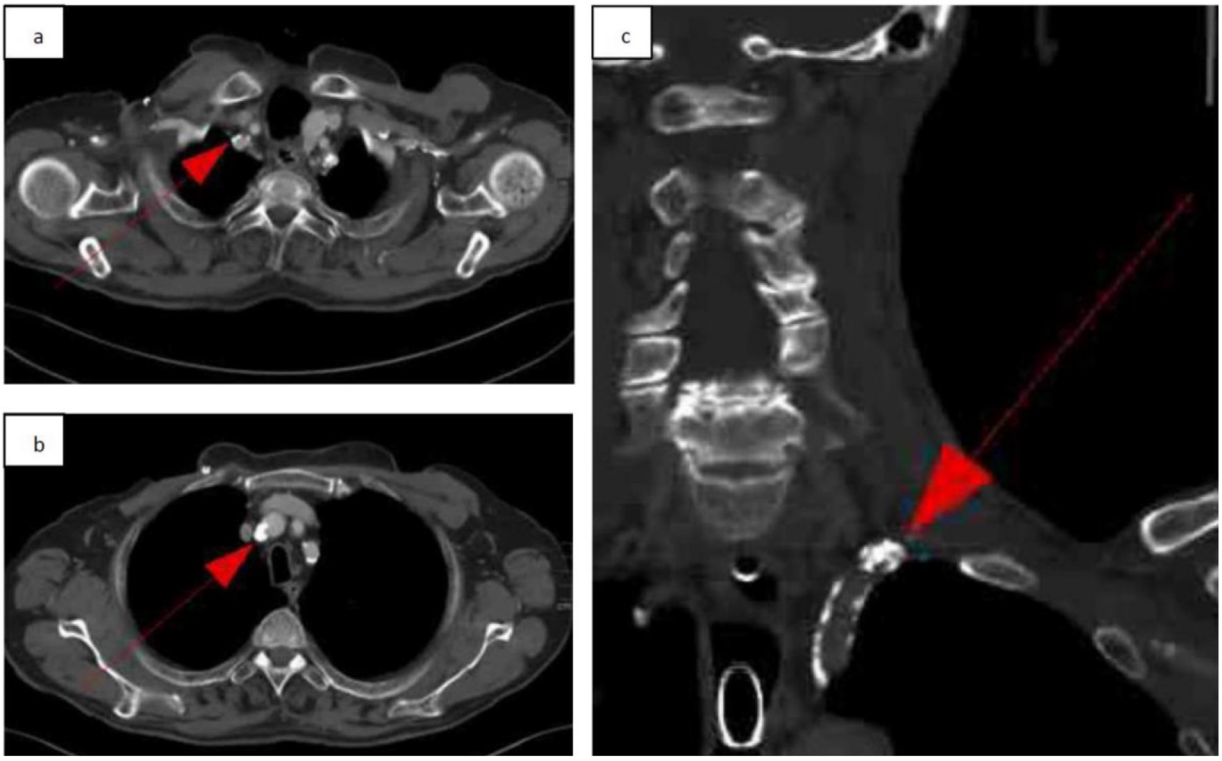

Fig. 4. CT scan of the neck and thorax.
(a) Stenosis of the right subclavian artery (red arrow); (b) Outlet of the internal mammary artery on the right (red arrow); (c) Stenosis of the left subclavian artery (red arrow).

alternative, in this case, we can mention the deep inferior epigastric perforator flap [15]. Furthermore, primary radiochemotherapy should also be considered as an alternative in case of a critical vascular condition. Finally, after two revisions, a satisfactory functional and the cosmetically acceptable outcome could be achieved. Therefore, a strength of the study is that it illustrates the relevance of pedicled regional flap reconstruction in head and neck tumor therapy. Especially in patients with multiple pre-existing conditions, the right therapy choice must be made under consideration of various factors. In particular, it should be emphasized that an alternative procedure should also be considered when planning a defect reconstruction. Thus, the possibility of pedicled flaps should always be evaluated [5,16]. Prospective multi-center examinations with multiple cases in complicated and restricted transplant situations should be performed. So that fixed guidelines for difficult defect reconstructions can be derived.

4. Conclusion

The preoperative vascular imaging of the subclavian artery outlets is not a standard diagnostic procedure in the surgical planning of pedicle flap procedures in the head and neck region. In exceptional cases, we recommend angiography of the neck and thoracic vessels. It allows a more precise selection of the graft. A temporary pharyngostoma is an option in extraordinary circumstances. Longterm daily wound management with regular necrosectomy form the basis for critical flap healing. The choice of suitable grafts should also take possible defect revisions in the further course into account.

Conflicts of interest

Matti Sievert, Michael Koch, Konstantinos Mantsopoulos, Maximilian Traxdorf, Sarina K. Mueller, Heinrich Iro, Claudia Scherl declare that they have no competing conflict of interest.

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Ethical approval

The study is in accordance with the Code of Ethics of the World Medical Association (Helsinki Declaration). The authors have obtained written informed consent from the patient to publish a case report. The patient's anonymity is preserved. Therefore ethical approval from the ethics committee is not needed.

Consent

Our clinical investigation is in accordance with the Code of Ethics of the World Medical Association (Helsinki Declaration). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request. Explicit permission has been given as part of the consent to publish images of the patient. Still, patients' name, initials, or hospital number were not used. The patient's anonymity is preserved.

Author contribution

Matti Sievert Conception and design of the study acquisition, analysis and interpretation of data, writing the article, review and editing of the manuscript, final approval of the version to be submitted.

Michael Koch Conception and design of the study, revising the manuscript critically for important intellectual content, final approval of the version to be submitted.

Konstantinos Mantsopoulos Conception and design of the study, interpretation of data, revising the manuscript critically for important intellectual content, final approval of the version to be submitted.

Maximilian Traxdorf Conception and design of the study, interpretation of data, revising the manuscript critically for important intellectual content, final approval of the version to be submitted.

Sarina K. Mueller Conception and design of the study, interpretation of data, revising the manuscript critically for important intellectual content, review and editing of the manuscript, final approval of the version to be submitted.

Heinrich Iro Conception and design of the study, interpretation of data, revising the manuscript critically for important intellectual content, final approval of the version to be submitted.

Claudia Scherl Administrating the project, literature research, conception and design of the study, desing of the methodoly, validation and supervision, acquisition, analysis and interpretation of data, writing the article and revising it critically for important intellectual content, final approval of the version to be submitted.

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Guarantor

Claudia Scherl.

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References

[1] R.A. Agha, M.R. Borrelli, R. Farwana, K. Koshy, A. Fowler, D.P. Orgill, For the SCARE Group, The SCARE 2018 statement: updating consensus surgical CAse REport (SCARE) guidelines, Int. J. Surg. 60 (2018) 132–136, http://dx.doi.org/10.1016/j.ijsu.2018.10.028.

[2] R.A. Agha, M.R. Borrelli, R. Farwana, K. Koshy, A. Fowler, D.P. Orgill, SCARE Group, The PROCESS 2018 statement: updating consensus preferred reporting of CasE series in surgery (PROCESS) guidelines, Int. J. Surg. 60 (2018) 279–282, http://dx.doi.org/10.1016/j.ijsu.2018.10.031.

[3] L. Lam, N. Samman, Speech and swallowing following tongue cancer surgery and free flap reconstruction - a systematic review, Oral Oncol. 49 (2013) 507–524, http://dx.doi.org/10.1016/j.oraloncology.2013.03.001.

[4] M.L. Urken, Advances in head and neck reconstruction, Laryngoscope 113 (2003) 1473–1476, http://dx.doi.org/10.1097/00005537-200309000-00008.

[5] K. Patel, D.J.H. Lyu, D. Kademani, Pectoralis major myocutaneous flap, Oral Maxillofac. Surg. Clin. North Am. 26 (2014) 421–426, http://dx.doi.org/10.1016/j.coms.2014.05.010.

[6] B.T. Andrews, T.M. McCulloch, G.F. Funk, S.M. Graham, H.T. Hoffman, Deltopectoral flap revisited in the microvascular era: a single-institution 10-year experience, Ann. Otol. Rhinol. Laryngol. 115 (2006) 35–40.

[7] A. Milenović, M. Virag, V. Uglešić, N. Aljinović-Ratković, The pectoralis major flap in head and neck reconstruction: first 500 patients, J. Craniomaxillofac. Surg. 34 (2006) 340–343, http://dx.doi.org/10.1016/j.jcms.2006.04.001.

[8] S. Herberhold, Bootz. Rekonstruktion im Oropharynx: Geeignete freie und gestielte Transplantate, HNO 61 (2013) 580–585, http://dx.doi.org/10.1007/s00106-013-2703-6.
[9] A.K.N. Leite, L.L. de Matos, M. Belli, M.A.V. Kulcsar, C.R. Cernea, L. Garcia Brandão, F.R. Pinto, Pectoralis major myocutaneous flap for head and neck reconstruction: risk factors for fistula formation, Acta Otorhinolaryngol. Ital. 34 (2014) 389–393 http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4346994&tool=pmcentrez&rendertype=abstract.
[10] A. Jena, R. Patnayak, R. Sharan, S.K. Reddy, B. Manilal, L.M.C. Rao, Outcomes of pectoralis major myocutaneous flap in female patients for oral cavity defect reconstruction, J. Oral Maxillofac. Surg. 72 (2014) 222–231, http://dx.doi.org/10.1016/j.joms.2013.06.205.
[11] S. Mehta, S. Sarkar, N. Kavarana, H. Bhathena, A. Mehta, Complications of the pectoralis major myocutaneous flap in the oral cavity: a prospective evaluation of 220 cases, Plast. Reconstr. Surg. 98 (1996) 31–37, http://dx.doi.org/10.1097/00006534-199607000-00006.
[12] J.N. McLean, G.W. Carlson, A. Losken, The pectoralis major myocutaneous flap revisited: a reliable technique for head and neck reconstruction, Ann. Plast. Surg. 64 (2010) 570–573, http://dx.doi.org/10.1097/SAP.0b013e3181c51f4a.
[13] F.L. Dias, R. Lima, J. Kligerman, C.R. Cernea, Therapeutic options in advanced laryngeal cancer: an overview, ORL J. Otorhinolaryngol. Relat. Spec. 67 (2005) 311–318, http://dx.doi.org/10.1159/000090040.
[14] M. Koch, J. Künzel, K. Mantsopoulos, J. Zenk, H. Iro, Defect closure after oral and pharyngeal tumor resection with the superiorly pedicled myocutaneous platysma flap: indications, technique, and complications, Eur. Arch. Oto-Rhino-Laryngol. 269 (2012) 2111–2119, http://dx.doi.org/10.1007/s00405-011-1891-5.
[15] M.W. Clemens, S.P. Davison, Buried deep inferior epigastric perforator flaps for complex head and neck contour defects, J. Reconstr. Microsurg. 25 (2009) 81–88, http://dx.doi.org/10.1055/s-0028-1090601.
[16] C. Scherl, K. Mantsopoulos, S. Semrau, R. Fietkau, M. Kapsreiter, M. Koch, M. Traxdorf, P. Grundtner, H. Iro, Management of advanced hypopharyngeal and laryngeal cancer with and without cartilage invasion, Auris Nasus Larynx 44 (2017) 333–339, http://dx.doi.org/10.1016/j.anl.2016.08.002.