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International News

Free flap surgery in Europe: an interdisciplinary survey

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Abstract. Free flap surgery is essential for the aesthetic and functional reconstruction of various parts of the body. The aim of this study was to compare current concepts of perioperative flap management between ENT, craniomaxillofacial, and plastic surgeons. A European survey was conducted among 570 surgical departments, covering all aspects of free flap surgery. Focus was placed on antibiotic and antithrombotic drug use, aspects of osseous reconstruction, and flap monitoring strategies. One hundred and seventy-two medical units participated. A broad spectrum of anticoagulant regimens and a trend towards prolonged antibiotic prophylaxis were found. Fixation with (CAD/CAM) reconstruction plates was more popular than monocortical locking with miniplates in the mandible. Visual assessment and Doppler systems were reported to be the most common monitoring modalities. The flap loss rate was stated to be higher after osseous reconstruction. Only a few differences in perioperative flap management were identified between the different surgical fields, and osseous reconstruction appears to be the most challenging.

Key words: free flap surgery; European survey; current concepts; microsurgery; anticoagulation; CAD/CAM.

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Free flap surgery has a long tradition in various medical specialties and is considered the workhorse for excellent functional and aesthetic reconstruction of various body parts, including the head and neck region, breast, and upper and lower limbs[1]. Microvascular tissue transfer is used for a wide range of indications, including combined defect situations after tumour resection, osteonecrosis, trauma, and severe burns. Depending on the standard of training, specializations of the institution, and particularities of the different national health care systems, most free flap surgeries are performed by either plastic and reconstructive surgeons or head and neck surgeons, including those from the departments of otolaryngology (ear, nose and throat; ENT) and craniomaxillofacial surgery (CMF).

Despite many years of microsurgical experience and awareness that each case requires individual planning and surgery because of its unique conditions, there is no generally accepted protocol or set of guidelines with recommendations on ideal preoperative, intraoperative, and postoperative flap management[2]. The flap loss rate has remained stationary at approximately 5–10% of all cases, despite improvements in the spectrum of flap choices, harvesting sites, and supportive tools. Hence there is a need for further research and critical evaluation of common and innovative techniques and instruments, especially regarding perioperative anticoagulation and antibiotics, fixation methods for bony reconstruction, and flap monitoring.

A Europe-wide survey was developed for use in both head and neck centres and plastic and reconstructive surgery (PRS) departments, in order to learn and compare the views of these different medical specialities on an interdisciplinary, transnational basis. The aim was to provide a foundation for future prospective studies on optimal regimens and treatments. Through the use of this survey, it was sought to gather information on the discipline, as well as factors that have an influence at the local and

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regional level, in order to compare different views, reflect diversities among the facilities and specialties performing these surgeries, overcome inherited centre-based concepts, and to summarize current trends. It was hypothesized that a wide range of treatment concepts related to all aspects of free flap surgery would be identified, especially regarding antibiotic therapy, anticoagulation, and flap monitoring techniques, and that differences in perioperative regimens may influence the success rate.

Materials and methods

A descriptive survey was designed consisting of three main sections. Section I collected information on the type of medical centre (university/non-university) and the medical specialty (PRS, CMF, and ENT). Section II was divided into four subsections. The first part collected information on the frequency, type, revision rate, and loss rate of free flaps, as well as information on the number of surgeons available for flap harvesting, anastomosis, and revisions, if indicated. The second part dealt with the surgical regimen in terms of the preferred type of bony reconstruction (primary vs. secondary), type of fixation (miniplates, reconstruction plates, computer-aided design and manufacturing (CAD/CAM) fixation), and the preferred microsurgical considerations (anastomosis: end-to-end or end-to-side; suture preferences: preferred thread, technique, and technical support). The third part of section II focused on the perioperative regimen regarding antibiotics (yes/no, duration, and indication) and anticoagulation (yes/no, type of drug administered, detailed information on the dosage, start time, and duration of intake). The fourth part consisted of items on flap monitoring modalities (by whom, frequency, duration, and laboratory–chemical examination) and details of the hospital stay in the intensive care unit and on the normal ward (average time and the use of mechanical ventilation). Finally, section III of the survey asked for the surgeon's opinion on the potential factors that most influence the success rate of free flap surgery in his or her view. Answers were requested in multiple-choice, yes/no, and free text formats. Where applicable, responses were measured using scales and categorizations that had been defined with critical levels.

Medical centres in 11 countries of Western Europe were included in the survey. Only PRS, CMF, and ENT departments were contacted. Questionnaires were returned anonymously. The participants were given the chance to declare themselves as belonging to an 'other' specialty without further clarification. All medical units were contacted by mail and given a response time of 6 months in total.

Frequency counts were graphically presented in bar graphs. Ordered logistic regression was used to assess the differences between the medical centre and medical specialty. Selected items were ranked on the average scores per medical centre and medical specialty and were then displayed graphically. The statistical analysis was performed using statistical software R version 3.2 (R Foundation for Statistical Computing, Vienna, Austria) and the ggplot2 package. Some graphics were created in Microsoft Excel 2013. A P-value of <0.05 was considered statistically significant.

Results

Participants

Five hundred and seventy medical units in 11 countries of Western Europe (Germany, Austria, Switzerland, France, Spain, Great Britain, Sweden, Norway, Italy, Finland, and the Netherlands) received the study questionnaire. A total of 148 PRS, 194 ENT, and 228 CMF departments were contacted. The response rate was 30.2% ($n = 172$). Eighty surveys (almost 50%) were returned from CMF departments, while 50 surveys were returned from ENT and 39 from PRS departments. Four participants stated to perform free flap surgery in a department other than ENT, CMF or PS. Only questionnaires returned from medical units that reported performing free flap surgery at least 1–10 times per year were included for further consideration ($n = 131$). The relative flap frequencies are illustrated in Fig. 1. In contrast to head and neck centres, which naturally handle more osseous defect situations, soft tissue flaps were found to be used at higher rates in PRS departments.

Revision and flap loss rates

The revision rate at the hospitals was stated as <5% by 83 respondents, 5–10% by 41, and >10% by seven. A significant difference in revision rate was found between the PRS and ENT units (>10% revision rate in 16% of PRS departments and 32% of ENT departments; $P = 0.001$) and between the PRS and CMF units (>10% revision rate in 16% of PRS departments and 3% of CMF departments; $P = 0.003$).

Regarding flap loss, no significant difference was found for the type of hospital ($P = 0.802$) or medical specialty ($P = 0.567$). Seventy-two percent of the departments reported a flap loss rate below 5%. A flap loss rate of >10% was indicated by 10 departments, and nine of them stated that this was only for osseous reconstruction.

Surgical considerations

Oral squamous cell carcinoma (OSCC) patients were treated at 90% of the medical centres. On average, two to five surgeons were available for harvesting, establishment of microsurgical anastomosis, and salvage procedures. Fifty respondents reported that osseous flaps were generally performed for primary reconstruction, whereas secondary reconstruction as a general concept was indicated by 12 respondents. Sixty-five medical centres performed both options, with the selection based on the individual characteristics of the patient. ENT departments preferred secondary reconstruction, whereas PRS and CMF surgeons were starting to use primary reconstruction more often. Primary reconstruction was exclusively performed by 39% of all departments, while 10% generally preferred secondary surgical treatment.

A similarly ambiguous picture emerged for the type of osseous fixation, with 42% preferring miniplates, 21% pre-bent locking plates, 18% conventional reconstruction locking plates, and 19% using patient-specific CAD/CAM locking plates and screws. On average, 42% of all medical units (53% of CMF departments, 34% of PRS, and 25% of ENT) used the CAD/CAM procedure for reconstructive planning of bony defects. For microsurgical anastomosis, there was a trend towards end-to-end sutures, with 40% of all units exclusively choosing this technique and 50% of all units using either end-to-end or end-to-side depending on the intraoperative anatomical occurrences. Additionally, an approach with 8–0 or 9–0 threads (94%) in combination with single interrupted sutures (73%) was preferred by most surgeons.

Medicinal considerations

With regard to perioperative anticoagulation, heparin use was reported by 86% of all units, but only four-fifths (81%) of these respondents reported using heparin at a therapeutic dose (weight-adapted). The other anticoagulant drugs used included acetylsalicylic acid (ASA, $n = 22$)) and hydroxyethyl starch solution ($n = 19$). Most units administered antithrombotic

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