

# Eight free flaps in 24 hours: a training concept for postgraduate teaching of how to raise microvascular free flaps

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## Abstract

Microvascular free flaps are complex but important tools in oral and maxillofacial surgery (OMFS), and though techniques to raise flaps are challenging surgeons often have little structured training. In this study we have evaluated a structured, three-day, hands-on, practical training course on raising flaps. Five human, Thiel-embalmed cadavers were used for training in how to raise the following flaps: radial forearm, anterolateral thigh, lateral arm, fibular, latissimus dorsi, scapular, iliac crest, and rectus abdominis. The total duration of the course was 24 hours over three days. All participants were asked to evaluate the design and conduct of the course, their own learning curve, and general questions about their knowledge of how to raise flaps and microsurgery. There was a significant increase in participants' assessments of how they raised all free flaps, except the lateral arm flap (4.74 (0.68) compared with 2.42 (0.81);  $p=0.052$ ) before and after the course. The radial forearm flap was thought to be the most relevant in clinical practice ( $n=40$ ; 75%), followed by the anterolateral thigh ( $n=5$ ; 9%) and fibular ( $n=4$ ; 8%) flaps. Comparisons between residents and consultants showed unsurprising differences in experience with microsurgery and self-assessment in raising particular free flaps before the course. We have shown that a structured, hands-on course using a well-established simulation model can significantly improve postgraduate surgeons' skills in raising free flaps.

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## Introduction

Surgical disciplines will have to cope with a substantial shortage of young professional people in the near future,<sup>1</sup> and there are several reasons for this. Many consultants and specialists are going to retire over the next couple of years.<sup>2</sup>

Demographic changes and a society with an increasing number of older patients, often with multiple, coexisting conditions that need specialist care, require more and more practitioners to keep up with rising expectations and demands.<sup>3</sup> Reduced working hours and a call for an improved work-life balance aggravate this.<sup>4,5</sup>

It is particularly important and challenging as up to 60% of medical students are women.<sup>6</sup> Access to surgical services worldwide is a serious problem which, if resolved, would save both lives and costs.

Surgical societies recommend that at least 10% of all medical school graduates choose a career in a surgical discipline

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to handle the imminent shortage of surgeons during the next decade, but to date this percentage has hardly reached 5%.<sup>7</sup>

Oral and maxillofacial surgery (OMFS) is unique, as in many countries double qualifications (in medicine and dentistry) are required to complete specialist training.<sup>8</sup> Training is therefore longer, and in many countries attracts substantial additional cost, which affects how attractive the discipline appears.

Studies have shown that a favourable experience of the discipline at an early point during medical school and favourable experiences during elective periods could convince a student to choose surgery as a career.<sup>9</sup> Practical, hands-on courses are particularly appreciated.<sup>10</sup> Teaching concepts in surgical disciplines should therefore be evaluated and both good and bad points should be identified and changed accordingly. Rosen et al. showed that the establishment of hands-on courses had appreciable effects on the selection of a particular medical career.<sup>11</sup> Structured teaching plays an integral part in whether medical students decide to follow a surgical career, and a further way to improve the attractiveness of surgical disciplines is to promote them in postgraduate education.<sup>12</sup> In addition to acquiring surgical techniques, students have to develop interpersonal skills during their surgical education to allow functional teamwork.<sup>13</sup>

It is difficult to cover the entire curriculum of a surgical discipline completely during training, and this is particularly true for complex techniques such as microvascular tissue transfer. Different concepts of teaching have been introduced in the past to guarantee a consistently high standard of care despite the complexity of many operations, and surgical simulation models have been developed to provide structured and reproducible teaching,<sup>13</sup> which are suitable to prepare students and residents for actual operations.<sup>14</sup> In the context of flap surgery cadaver models are the best.

In this study we have evaluated a structured teaching concept for raising free flaps in a compact, anatomical, hands-on course in human cadavers for trainees and established specialists.

## Methods

Five Thiel-embalmed cadavers were used.<sup>15</sup> All donors had voluntarily donated their bodies to medical research. Two participants worked on each side of the cadaver, and a total of eight free flaps were raised. They were given structured training in raising the following free flaps: the radial forearm, anterolateral thigh, and lateral arm flaps (Fig. 1), and the fibular, latissimus dorsi, scapular, iliac crest, and rectus abdominis flaps. The total duration of the course was 24 hours, divided into three parts on three different days of nine and six hours each. An introduction 15 minutes long about the theory was given before the hands-on part. During the practical part, flaps were raised in two steps, which were initially demonstrated and then repeated by the participants under close supervision. The raising of the fibular



Fig. 1. Raising of a lateral arm flap in a human cadaver model during the training course.

free flap was divided into three steps. The radial forearm, anterolateral thigh, and rectus abdominis flaps were artificially perfused using an external perfusion system to simulate pulsation and to illustrate the topography of the perforating vessels (Fig. 2).<sup>16</sup>

At the end of the course the participants were asked to fill out standard evaluation questionnaires about the design of the course and the teaching. They were asked to assess their own confidence in raising the different free flaps before and after completion of the course, and their experience in microvascular techniques. Results were assessed using the Likert scale, which ranged from 1=very good to 5=very bad. Participants were also asked to rate the free flaps according to their clinical relevance. Their clinical experience in raising flaps was assessed depending on the number of flaps raised ( $a \leq 5$ ,  $b = 5-10$ , and  $c > 10$ ), and the acquisition of knowledge about free tissue transfer.

All data were analysed with the help of IBM SPSS for Mac software (version 22.0; IBM Corp, Armonk, NY). Data are expressed as means (SD). The significance of differences were compared using Student's *t* test or the Mann–Whitney *U*



Fig. 2. Perfusion pump connected to the iliac vessels during the raising of an anterolateral thigh flap during the training course.

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