

EDITORIAL

Reaching out!

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In this edition of the Netherlands Journal of Critical Care Dr. Anne Sophie Kruit and colleagues from the Department of Plastic, Reconstructive and Hand Surgery of the Radboud University Medical Centre, Nijmegen, the Netherlands, chaired by Professor Steven Hovius, are given centre stage with their article on the initiation of a Dutch 'VCA transplant program'.^[1] Vascular composite allograft (VCA) transplantation involves transplanting multiple structures that may include skin, bone, muscles, blood vessels, nerves and connective tissue. Face and hand transplants are the most commonly-known types of VCA which are attracting extensive scientific and popular media coverage.

The article by Kruit et al. focuses on bilateral hand transplantation. By chance, the timing of the submission of the manuscript and writing of this editorial coincided with the period around the New Year celebrations, a time known to be associated with severe injuries, including injuries to the hands. An estimate over the past 13 years suggested that between 400 to 1000 patients (mean 685) are treated in Dutch hospitals on 31 December and 1 January each year after an incident with fireworks. Injuries to hands/arms and eyes are most commonly reported.^[2] Not surprisingly, the second ever successful hand transplantation was performed in a patient who lost his left hand in a fireworks accident.^[3] The first successful hand transplantation was reportedly performed for a circular saw injury.^[4]

In contrast, the patient described here by Kruit et al. suffered from symmetrical peripheral gangrene (SPG), a devastating complication of sepsis that features acral (distal extremity) ischaemic necrosis in a largely symmetrical manner, due to microcirculation disturbances, and not to occlusion of the large supplying arteries.^[5] The ischaemic changes can be limited to the distal extremities, for example the digits, as regularly seen in daily practice in intensive care medicine in patients with septic shock. Although attention for this complication has increased recently, the earliest case report dates back to 1891,

describing a 37-year-old man, after a period of presumed septic shock,^[6] one of the most common reasons for ICU admission. A review by Knight in 2000 also stated that SPG also occurs 'in non-septic patients with hypovolaemic and cardiogenic shock',^[7] a presentation so far not yet personally witnessed in almost 20 years of ICU experience. Yet, ischaemia may advance proximally and involve the larger parts of the extremities, or even the whole extremity or extremities, as illustrated by the patient for which the quest for a suitable VCA now continues in the Netherlands. Of these more severe cases, less than 100 have been reported in the literature so far. Interesting reviews on the possible mechanisms leading to limb loss have been published recently.^[8] The resulting extremity or partial extremity loss is an extensive and evolving threat to the physical, psychological and social functioning of the patient, thus resulting in disability in many different ways.

Taking into account a wide array of legal, ethical and medical aspects, a VCA program 'can now offer a hand amputee a transplantation that has the possibility of dramatically improving the quality of life from the point of view of the disability', as stated by Viktor Meyer, Professor of Surgery in Zurich, Switzerland.^[9] The potential benefits of having a more functional extremity compared with a prosthesis seem obvious and are envisioned by both the medical team and the potential recipient. Obviously, the level of baseline physical functioning and psychological well-being is better for unilateral than for bilateral amputees. Although the functional gain is higher in patients with bilateral loss of their hands, functionality, aesthetics and completion of the bodily image of the patient is also increased after transplantation in unilateral amputees.^[10, 11] An update of outcomes summarising the worldwide experience in 2015 was based on 107 hand-arm transplants in 72 patients. Notably, the surgical procedures have been performed by many different teams in many different settings, in many different countries. In at least nine countries in Europe, 54 transplants

have been performed, in 33 patients. The current results may be further improved if we limit execution of such highly complex surgical procedures to a limited number of countries in Europe, or at least to one centre in the Netherlands, acknowledging the literature on volume-outcome relationships. Nevertheless, the reported results are promising in the perspective of the fact that the oldest graft surviving to date was transplanted 19 years ago.

The identified patient-perceived benefits of hand transplantation may, however, not be able to offset the excessive societal costs associated with the procedure. For kidney transplantation, society is of the opinion that the cost of a transplant is worth the improvement in quality of life on the one hand, and decreases the substantial costs of dialysis on the other. In contrast, hand amputation is not a life-threatening condition (although it is severely disabling), and there is a viable, less costly alternative available in the form of a prosthesis.^[12] Indicatively, in 2010, the lifetime costs for single hand transplantation were described to average 528,293 US dollars, whereas costs for double hand transplantation averaged 529,315 US dollars.^[12] In contrast, total costs of prosthesis adaptation for unilateral and bilateral amputation were estimated at 20,653 and 41,305 US dollars respectively. In an economic analysis of hand transplantation in the US the incremental cost-utility ratio of double hand transplantation, when compared with prosthesis, was thought to exceed the traditionally societally accepted cost-effectiveness threshold by far.^[12] Although perhaps neither medically necessary nor monetarily desirable, a tailored, individualised approach is possible and warranted for all hand amputee patients.

Apart from the abovementioned role for team expertise and exposure, patient selection appears paramount. This is, for example, illustrated by the scientific debate on the falsification of the nature of the hand injury of the first ever recipient, and his non-compliance to both the immunosuppressive and rehabilitation regime.^[9] In the case described by Kruit et al., the patient reports finding the arm prosthesis heavy and often restricting, and an alternative in the form of advanced stage robotic hands is not available due to technical procedure-related limitations (no space for the computerised hardware). She is psychologically stable, motivated, compliant, understands and is able to weigh up the risks, and also fulfils the other inclusion criteria. The patient has also figured in the popular media, and then stated: 'The most important goal for me is to regain my independence. I am willing to do anything to achieve that goal!'^[13]

This, however, raises the question to what extent 'it is really possible to communicate to such patients what the complications of immunosuppression, such as viral and fungal infections or malignancy, could actually mean for them and what their life after transplantation may look like' in case of such complications.^[9] The seemingly huge potential benefits are perhaps likely to overshadow the associated mid and long-term

risks associated with the immunosuppressive regime, despite compliance with a preoperative informed consent procedure. Or, in other words, as many of us have heard patients voice 'Well, yes, of course I remember hearing about that (risk explained), but I never thought it would happen to me!', as Meyer anecdotally reported in 2001.^[9] In general, this is something to carefully, timely and repeatedly discuss with the patients. However, this is not different from commonly accepted and state of the art practice for many other decisions by patients on complex medical issues, such as euthanasia, or organ donation after euthanasia as now practised in contemporary medicine. In our experience such patients are perfectly able to make such decisions, provided the above-mentioned boundary conditions are respected. In this perspective, we are also confident that the initial 'outcry' has resulted in a well-balanced, informed decision of the patient described here.

In addition, the experienced very careful preparatory medical and organisational process including requesting input from, as well as informing, the important stakeholders in the different hospitals, inspires confidence and trust that this pioneering development can be completed successfully, from both the technical as well as the patient's points of view. We applaud the team for their ways of communication and collaboration in this regard, and reach out to the readers of the NJCC to take note of this interesting new development in Dutch transplantation history!

Disclosures

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