

Key psychosocial challenges in vascularized composite allotransplantation

Martin Kumnig, Sheila G Jowsey-Gregoire

Martin Kumnig, Department of Medical Psychology, Center for Advanced Psychology in Plastic and Transplant Surgery, Innsbruck Medical University, 6020 Innsbruck, Austria

Sheila G Jowsey-Gregoire, Department of Psychiatry and Psychology, Mayo Graduate School of Medicine, Mayo Clinic Rochester, Rochester, MN 55905, United States

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Correspondence to: Dr. Martin Kumnig, PhD, MSc, Professor of Clinical Psychology, Department of Medical Psychology, Center for Advanced Psychology in Plastic and Transplant Surgery, Innsbruck Medical University, Schöpfstraße 23a, 6020 Innsbruck, Austria. martin.kumnig@i-med.ac.at
Telephone: +43-512-50427709
Fax: +43-512-585418

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Abstract

Psychosocial factors are important elements in the assessment and follow-up care for vascularized composite allotransplantation (VCA) and require multidisciplinary evaluation protocols. This review will highlight differences between VCA with solid organ transplantation (SOT), provide information on the psychosocial selection of VCA candidates, ethical issues, psychological outcomes, and on the need for multicenter research. VCA is primarily a life-enhancing procedure to improve recipients' quality of life and psychological well-being and it represents a potential option to provide reproduction in case of penile or uterine transplantation. The risk benefit ratio is distinctly different than SOT with candidates desiring life enhancing outcomes including improved body image, return to occupations, restored touch, and for uterine transplant, pregnancy. The Chauvet Workgroup has been convened with membership from a number of transplant centers to address these issues and to call for multicenter research. A multicenter research network would share similar evaluation approaches so that meaningful research on psychosocial variables could inform the transplant community and patients about factors that increase risk of non-adherence and other adverse psychosocial and medical outcomes.

Key words: Vascularized composite allotransplantation; Psychological evaluation; Motivation; Psychosocial outcomes; Quality of life

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Core tip: A psychosocial evaluation for vascularized composite allotransplantation (VCA) is unique and should be informed by many characteristics that are described in this review article including the importance of multidisciplinary care and the need for careful selection of candidates for VCA. Important areas to

consider in the evaluation include: History of ability to comply with medical care, body image, adaptation to previous trauma and preparedness for transplantation, reasonable expectations, and presence of adaptive coping skills of the candidate. Multicenter research will support better understanding of psychosocial variables that predict outcome. Optimally, developing a common evaluation strategy to enhance comparison of candidates with good outcomes to those with less optimal outcomes will help in future selection of candidates.

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THE HISTORY OF VASCULARIZED COMPOSITE TISSUE ALLOTRANSPLANTATION

The rapidly expanding vascularized composite allotransplantation (VCA) field combines the technical challenges of surgery and microsurgery with the multidisciplinary care that characterizes solid organ transplantation (SOT)^[1,2]. The technical demands of VCA and complex psychosocial issues pertaining to the recipients significantly accounts for the discrepancy between these two related fields^[3]. Although VCA and SOT share a common history, VCA has not yet been performed on a scale approaching that of SOT^[1,4]. Currently, the following four main domains for VCA exist: hand, face, uterus, penis transplantation although other areas are emerging.

In the history of medicine there are several well documented cases that demonstrate the developing concept of reconstructive transplantation medicine^[2,5,6]. One such account is "The Legend of the Black Leg (Leggenda Aurea)", about twins Cosmos and Damian, who transplanted the leg of a man with that of an Ethiopian in 348 AD^[7]. In the 16th century, in Italy, Gaspare Tagliacozzi transplanted a nose from a slave to his master^[8]. Reports of tissue transplants occasionally were reported^[6]. Bunger^[9] performed a transplant involving a sheepskin. Carrel^[10] attached an artery from the arm of a father to the leg of his infant son who suffered from intestinal bleeding^[11]. Guthrie^[12] transplanted dog heads onto the neck of other-dogs. Although surgical techniques were created, the immunological challenges made transplant unfeasible^[13], until the discoveries of Medawar and colleagues^[14], who described rejection which allowed advances leading to modern transplant immunology^[5,15]. In 1957 Peacock *et al*^[16,17], coined the term composite tissue allograft

and in 1964, Robert Gilbert^[18], performed the first hand transplantation (HTx) in Ecuador. A single hand was transplanted to a bilateral hand amputee, but the graft was amputated three weeks later as a result of acute rejection. This early unsuccessful experience contributed to a 30-year period of stagnation in the field. Significant developments in immunosuppressive drug therapy facilitated the growth of SOT^[2,5]. The next two HTx were performed in 1998 by pioneers Dubernard *et al*^[19-21] in Lyon and in 1999 Warren Breidenbach^[22] in Louisville, thus starting the modern era of reconstructive HTx^[6]. Since 1998 73 HTx, 23 unilateral and 25 bilateral transplant, for a total of 48 patients have been reported^[23].

The encouraging outcomes in human hand transplants led to the development of human face transplant (FTx) programs^[6]. In 2003, surgeons in Nanjing, China transplanted a skin flap including an extensive part of the scalp and both ears^[24]. In 2005, by transplanting a triangular graft from the nose to the chin including the lips, Bernhard Devauchelle and Jean-Michel Dubernard from Lyon performed a partial face transplant on a woman disfigured by a dog bite^[13,25]. In April 2006, a 30-year man suffering from trauma from a bear, received the second face transplant^[26].

Face transplantation has garnered wide interest with the public and in the media due to the importance to identity that the face represents. Therefore, psychosocial issues in FTx are as important as in HTx or more so and the multidisciplinary evaluation and treatment has to ensure that these are addressed adequately. Since the first FTx in 2005, almost 32 face transplants have been performed worldwide with promising outcomes including reasonable functional improvements and reports of patients satisfaction^[23,27].

Recently, penile (PTx) and uterine transplantation (UTx) are the focus of VCA research. In 1992, a conceptual framework for human PTx was developed by Eberli *et al*^[28] in 2008 who transplanted bioengineered penises onto rabbits. In 2006, a Chinese man received the first donor penis, but the transplant had to be removed by surgeons at the request of both the patient and his partner. This first case emphasizes the psychological impact that transplants can have, especially with an organ as significant to sexual function and identity as the penis. The first successful PTx was performed on a 21-year-old man in December 2014 by André van der Merwe and Frank Graewe at the University of Stellenbosch in South Africa^[29]. Subsequently, the recipient has been reported to have recovered function in the organ (including urination, erection, orgasm, and ejaculation), and has, remarkably, since successfully conceived a child^[30].

The earliest UTx was performed in 1931 on a transgender woman in Denmark who died from rejection three months after transplantation^[31]. The development of *in vitro* fertilization in the late 70s resulted in decreased interest in this area^[32]. Two UTx

attempts by teams with no preceding research records in this field followed. In Saudi Arabia in 2000 an UTx was performed from an older hysterectomy patient into a 26-year-old. The graft failed due to vascular occlusion^[33,34]. In 2011, the second transplant involved a uterine graft from a deceased female multiorgan donor^[35]. This case resulted in two pregnancies but with early miscarriage^[36]. The first mother-to-daughter uterine transplant was performed in 2012 in Sweden^[37]. Following extensive preliminary research that UTx is a treatment for absolute uterine factor infertility (AUI) and that also this AUI treatment, which combines *in vitro* fertilization and UTx, this is now a viable option for selected infertile patients^[38]. The UTx project encompasses a total of 9 recipients and the first live birth after UTx was reported^[39]. Because of the risks of an invasive organ transplant procedure and to avoid the need for lifetime immunosuppression, this is considered a temporary transplant with the expectation of hysterectomy after couple of successful pregnancies^[38].

As already determined from SOT, transplant outcomes depend on the selection of an optimal combination of immunological, surgical, and psychosocial factors. The history of VCA underscores the importance of interdisciplinary assessment before surgery. A patient's psychosocial suitability for VCA is as important as the surgeon's technical ability and the effectiveness of postoperative immunosuppression^[3]. Several cases of noncompliance with immunosuppression and physical therapy reveal how allograft survival needs to be supported by psychosocial stability and an ability to comply with complex medical care^[3]. This is especially critical when the graft is involved in tasks related to a part of the body that senses, supports instrumental tasks of daily living, and is visible to others^[2,3]. Additionally, what all kinds of VCA have in common is the fact that there are still ethical concerns regarding the entire procedures, especially because the VCA is a life-enhancing not life-saving procedure, with psychosocial issues like quality of life (QOL), body image, psychological well-being, etc. weighing significantly in the risk benefit ratio of candidates considering VCA^[3,40].

At present the number of successful VCAs is increasing and several transplant centers worldwide have developed specific VCA programs^[40]. Although research provides some understanding of functional and sensory outcomes, psychosocial outcomes have been minimally reported^[3]. We will discuss in this paper aspects of VCA transplantation that have been reported in the literature and extrapolate from literature in SOT to anticipate key areas of interest to enhance psychosocial outcomes in VCA and discuss the key psychosocial challenges we face in VCA today.

PSYCHOSOCIAL IMPLICATIONS OF VCA

As already discussed, certain characteristics of VCA are uniquely different from SOT, particularly because

VCA is primarily a procedure to improve the recipients' QOL and psychological well-being or represents a potential option to provide reproduction in case of PTx and UTx. Since candidates considering VCA present no life-threatening illness, their motivation related to improved functional outcomes, occupational attainment, improved body image, restored touch, and in uterine transplantation, pregnancy^[3]. Therefore, scientific consensus exists that the assessment of the candidates' desire for VCA is a psychologically complex and warrants a customized psychosocial evaluation protocol that fully addresses the issues noted above^[3].

Again, comparing the psychosocial characteristics of VCA with SOT, the visible nature of the allograft strikingly changes the experience of transplantation for VCA recipients^[40,41] (other than UTx). Visible grafts could adversely effect the recipients' sense of themselves as an integrated whole, leading to rejection of the grafts as undesirable^[42]. Several cases demonstrated the importance of the successful psychological integration of the allograft for post-transplant outcomes, *e.g.*, amputation of the first successfully transplanted penis because of the recipient's and his partner's coping inability. Notably, patients must accept a new graft while adapting their loss of a part of their body that was unique to them^[43]. This requires alterations in their sense of who they are, how the graft fits in with their body, and ultimately acceptance of the allograft as part of themselves^[44].

When considering factors that could impair candidates' adherence with medications and physical therapy^[45-47], relevant information will be obtained by examining their psychiatric history, coping abilities, and social support^[48]. In Coping styles, support from family and friends, financial, and logistical factors emerge as important predictors of successful outcomes^[48]. Therefore, the evaluation protocol should additionally provide an assessment of family relationships and anticipate stress that might come from media attention which has occurred in a number of VCA cases^[49]. Patients will experience an initial decrease in function and caregivers will need to prepare for increased recipients needs for instrumental tasks of daily living potentially while also carrying a heavier burden of caring for children and maintaining employment^[3].

Ethical considerations

Aside from considerations of technical demands regarding modern transplant programs and costs, the field of VCA involves a number of ethical issues^[50]. The principle of patient autonomy is necessary for these procedures balanced by nonmaleficence to support limited risk to patients. It would appear that beneficence and justice are equivocal in this population^[51].

No instruments exist to fully measure the impact of hand(s) loss, facial distortion, the loss of penis, and reproduction inability^[3]. This makes the assessment process in VCA especially challenging^[51]. Prospective research and qualitative studies should focus on the

unique qualities of this experience including the highly individual nature of the VCA including, spiritual and cultural factors that also may be important^[52]. Ethical issues are myriad and collaborating with biomedical ethics experts would do justice to the complex issues that may arise for this patient population^[3].

Three important ethical considerations are patient selection, patient advocacy, and informed consent^[53]. When assessing for decision-making capacity and the candidates' overall ethical suitability to receive a VCA, the ethical guidance process should be based on this rubric of questions^[54,55]. Similar to living donation, the Lyon team viewed the first HTx decision as being one in which the candidate had to weigh the pros and cons from themselves^[56]. Informed consent for VCA recipients is a detailed process focusing on risks in surgery and anaesthesia and post-surgical complications (e.g., immunosuppressive effects, psychiatric disorders, etc.)^[53,54,56]. Consent related to the donor, is also an area of interest with some countries having an "opt-out" system with implications for how families may experience the donor related experience^[56].

Ethical considerations were noted in the "Montreal Criteria for the Ethical Feasibility of Uterine Transplantation"^[57] that describe a set of criteria for the ethical practice of UTX in humans and we refer interested readers to the original paper on this. Key points include that the candidate has failed other therapy and is not eligible for other options such as adoption. An assessment of the candidates' ability to manage the tasks of motherhood is noted. The donor must have decided that their reproductive years are concluded and be able to consent to donate and be free of coercion. Finally, the institution must have all the needed staff and facilities to provide the care and ensure informed consent for donor and recipients as well as protection of anonymity in the process.

In addition, another important and challenging question is a philosophical one related to how allograft represents personal identity including implications for how one communicates with others^[56]. In case of PTx we have to consider the function of physical intimacy. The intimate nature of the grafts may have implications for others with whom the donors have been intimate and for future partners of the recipient^[6,50,56,58].

In summary, the ethical issues in VCA are quite complex and are unique to this population and effect the recipients very sense of being^[50], which may impact post-transplant motivation^[59,60]. Utilizing biomedical ethics consultation on a case basis may be especially helpful for this population^[51].

Risk-benefit considerations

As noted in the international literature, VCA is life enhancing rather than life saving such as in the case in SOT^[1,56]. VCA candidates may overestimate the benefits of the procedure while minimizing the recovery period and not fully acknowledging the

surgical risk, demanding post-transplant medication regimen, and rehabilitation requirements^[3,61]. The risk-benefit ratio is quite different than SOT in which the risks are offset by the lifesaving nature of the procedure^[3,40,51]. VCA candidates have to face potential episodes of acute rejection^[62] and immunosuppression-related complications which are typical but can be reversed with proper medical treatment^[63,64]. Chronic allograft rejection that is predicted by the frequency and timing of rejection episodes has become a primary cause of long-term allograft failure^[62]. Particularly, the risks of nonspecific immunosuppression^[50,65] and the lengthy rehabilitation are the most important critical aspects that may lead to demoralization and non-adherence in rehabilitation^[52,66]. Rejection episodes and delayed function, difficulty with the rehabilitation, and long-term side effects of immunosuppressive treatment (e.g., malignancy, metabolic infections/disorders, diabetes, renal failure, etc.)^[50,65] may cause mood changes, anxiety as well as depressive reactions that substantially impact patients' adherence and require supportive treatment.

Although immunoregulatory protocols continue to be developed with decreased toxicity^[67] immunosuppressive medications are still required^[3], necessitating careful patient selection given the problematic nature of the risks of these therapies^[68] including infection, metabolic derangements^[46,47,69,70], toxicity^[70-73], and cancer^[69-74]. This potential improved function must be balanced against this significant risks^[63,67]. Patients have different risk thresholds which contribute to their decision making about how much risk they are willing to accept for improved function^[55,66,75-77], especially taking the psychosocial aspects of VCA into account (e.g., QOL factors, sense of identity, understanding of the treatment and its limitations, etc.)^[50]. In summary, the risk vs benefit decisions has to be judged on wider criteria that must include all relevant psychosocial aspects of VCA^[78].

Despite the encouraging results regarding the aesthetic and functional outcomes that have been achieved in patients who have undergone HTx in the last 15 years, risks persist^[50,66,75,76]. The International Registry on Hand and Composite Tissue Transplantation (IRHCTT)^[23,64] represents the world's largest database and research initiative to collect information from each case of VCA or composite tissue allotransplantation (CTA), thus it provides a comprehensive overview about what is happening in this new field of transplantation medicine. Currently, the IRHCTT includes cases of upper extremity and face allotransplantation performed all over the world^[23] with rejection rates of 85% of the hand and face patients in the first year and three recipients have died^[23,64]. Seven hand grafts were lost due to rejection in China^[23,63] and a similar number have been lost to rejection and other complications in European and American experience^[23,63,64,79,80]. Fortunately rejection was often detected and treated

without loss of graft^[23,63,64].

This literature highlights the need for careful patient selection to ensure that proper adherence to medication regimens occurs^[3,68]. Unilateral amputees appear to be more risk adverse due to the less compelling need for the graft while bilateral hand patients may be willing to accept the risk of rejection which is offset by the potential for significantly enhanced independence^[3,77].

Similar to the risk-benefit profile of HTx candidates, those who consider FTx also have to face specific risks and make their decision on the expected benefits^[81]. Beside the documented benefits of FTx, such as the improved functionality (*e.g.*, ability to breathe, speak, swallow, smile, *etc.*), the restoration of a near-normal facial appearance, and the reduction of pain and discomfort (FTx is one large procedure, whereas conventional face reconstruction involves many surgeries), there are certain risks that tend to be peculiar to FTx. For example, the donor's appearance is not transferred to the recipient and the recipient is not typically recognizable immediately following surgery, so that the patient potentially may feel upset about having a new (changed) face^[81-84]. The IRHCTT^[64] data document episodes of acute rejection in 60% during the first year after FTx (on average two episodes per year). One FTx team declared a case of "chronic" rejection whereas other teams described chronic rejection to the IRHCTT. When looking at the patients' survival: One patient (simultaneous face and bilateral hand transplantation) died for cerebral anoxia on day 65; one patient died for lung failure 11 mo after transplantation; one patient died for pharyngolaryngeal neoplasia 3 years after transplantation. Only one graft has been removed for unknown causes. In addition, the following complications/side effects have been reported: opportunistic infections (*e.g.*, herpes virus, bacterial infection, *etc.*), metabolic complications (*e.g.*, hypertension, increased creatinine values, *etc.*), malignancies (*e.g.*, basal cell carcinoma, pharyngolaryngeal neoplasia), and other side effects (*e.g.*, neurofibromatosis of the transplanted face, trauma of grafted face, *etc.*)^[27].

Candidates who consider PTx or UTx share the same burdens and risks that are characteristic of VCA. The candidates have to face the risks of the surgical procedure, of ischemic injury, of graft loss, and psychosocial complications (*e.g.*, inability to accept the allograft, interpersonal conflicts, non-adherence, *etc.*)^[85]. In the case of UTx, additionally, the risks of living donors (in most cases the mother of the female recipient became the donor who provided the uterus) need to be considered since they have to bear the particular burden of hysterectomy. Notably, the examination of mental conditions and QOL after hysterectomy is important, because a donor may have decreased QOL due to complications (*e.g.*, affected sexuality). Donors after hysterectomy may have unstable mental conditions including anxiety and

depression, and may have additional burden from severe stress due to postoperative pain^[85]. Because the uterus is a symbol of femininity, childbearing, sexuality, vitality, youth, attractiveness^[86-88], the hysterectomy can lead to postoperative regression^[89-92], distortion of body image^[87,93], and loss of feminine self-image^[94].

PSYCHOSOCIAL RESEARCH IN HAND TRANSPLANTATION

While it is universally accepted that a psychosocial evaluation is needed in SOT^[95,96], the literature is still evolving and no single evaluation strategy has emerged^[3]. Although no standard approach has been published^[20,22,41,49,51,97-113], several domains have emerged as important and predictive of increased risk^[3,114-121]. Recent efforts in research are occurring to attempt to address this deficiency in the literature^[40].

Generic instruments have been developed to identify areas relevant to transplant populations (*e.g.*, psychiatric disorders, adherence, transplant health literacy, *etc.*)^[3,122-124], but are not designed for areas specific for HTx such as satisfaction with prostheses, body image, physical limitations, and phantom limb pain^[40]. Creating a screening instrument customized for these patients is a goal for the field^[40,125].

A review of psychosocial evaluation strategies has been previously reported^[40] which includes semi-structured psychiatrist or psychologic evaluations and/or psychometric and projective testing^[20,22,41,49,51,97-113]. Case studies focusing on patients QOL, satisfaction with outcomes, and body image improvements have been a large part of the research reported^[40,101]. Overall, the majority of recipients reported having psychologically integrated the hand, and reported improved confidence in appearance and in social situations^[102,105]. The recipients assimilated the transplanted hand(s) into their body-/self-image and were able to develop a sense of "ownership". Another important outcome was the observed improvements in QOL and ADLs^[3].

Unmet expectations and either new or recurring psychiatric conditions have been reported^[126]: Including suicide attempts following hand transplant^[105]; request for amputation because the recipient could not integrate the grafted hand into his sense of self^[111]. The inability to psychologically incorporate the transplanted hand(s) may result in non-adherence with medications^[40,45-47], which in turn will lead to rejection and may necessitate amputation^[45]. Additionally, recipients may be frustrated with the lengthy process of recovery including loss of ability to do tasks while rehabilitating leading to decreases physical QOL at least initially^[3,63].

Optimally, candidates will have a strong motivation for transplant and have demonstrated good compliance with medical care in the past, have strong family support, utilize acceptance, flexibility and problem

solving in adapting to the loss of function from the injury/deficit and for future rehabilitation following transplant^[3,127-129]. Having appropriate expectations regarding immunosuppressive risks, surgical complications, and realistic understanding of functional gains after transplant is the best scenario for a psychologically prepared candidate^[55,61].

The optimal assessment includes: Health literacy regarding transplantation, assessment of pain related to amputation and phantom limb pain, family support, adaptation to prosthesis, financial and family stressors, assessed through multiple interactions with a variety of assessors including psychiatrists, psychologists, social workers, hand therapists, and all team members^[3,48,130]. Future research efforts directed at sharing similar evaluation strategies across centers in research protocols to determine best practices and predictive factors for optimal outcomes are needed^[3]. Another important component of interdisciplinary screening should be the identification of at-risk candidates. Intervention strategies to assist these candidates might then lead them to be eligible for this treatment and might especially be beneficial in supporting their ability to succeed with medication adherence and overall QOL post transplantation^[3,49,131].

PSYCHOSOCIAL RESEARCH IN FACE TRANSPLANTATION

FTx results in a visible change that affects social interactions and self-esteem in a profound way^[81,132], because the face is closely linked with a person's identity^[83] and can be conceptualized as an allotransplant with various functions (including communication, expression of emotion, perfection, *etc.*)^[133]. For this reason, FTx is never performed for cosmetic reasons alone^[134]. In the case of facial disfigurement, several difficulties, such as depression, anxiety, low self-esteem and QOL, poor marital and social relationships, and changes in body image have frequently been reported^[135]. What all types of VCA have in common, including FTx, is the fact that increased emphasis is placed on informed consent for a life-enhancing surgical procedure. Speech therapy and reintegrating into social settings are important^[134] as are tracheotomy care and strategies for maintaining nutrition^[81,136]. Plans for managing graft failure with a skin graft or flap are also described in the literature^[134].

When selecting candidates for FTx, the idea that the ideal candidate should not manifest some degree of anxiety and depression may be unrealistic, because patients with facial disfigurement suffer from painful dentition, chronic pain disorders related to damaged orofacial structures, and may have residual symptoms of PTSD. The candidate's adaptation to disfigurement using adaptive strategies rather than avoidance has been described^[81]. Similar to other types of VCA, there are specific psychosocial domains that need to

be considered in FTx evaluation protocols, including perception of appearance, mood disorders, presence of chronic pain, social ostracism, QOL, confidence, and social connectedness and integration^[81]. In addition to the semi-structured psychological interviews that are used to assess potential candidates for FTx, specific rating instruments (predominantly self-report measurements) have been developed for the purpose of prioritizing candidates for FTx: (1) the Perception of Teasing-FACES^[137]; (2) Facial Anxiety Scale-State^[138]; and (3) the Cleveland Clinic FACES score^[134,136], analogous to the MELD score. Usually, the pre-transplant psychosocial evaluation protocol used to identify the suitability of candidates for FTx, served as basis for the comparison in the post-transplant period^[83]. To improve the candidates' pre-transplant assessed suitability and to give them adequate support during the course of FTx, psychiatric and psychological consulting/treatment were performed^[84].

Concern about depersonalization towards the transplanted face and identity confusion with the donors face have not been reported^[27], and psychological outcomes for recipients of FTx have been generally favorable^[139,140]. The review of international literature about the assessment of psychological outcomes after FTx shows lower rates of depression and verbal abuse and significantly improved body image and social integration^[81,82,134,141-145]. Some studies report an initial decrease of psychological functioning and QOL immediately after FTx^[81,83,134]. In such cases the recipients have often adjusted to their deficits before transplantation and the extensive rehabilitation may lead to a temporary decrease of these psychosocial factors. In addition, psychological findings point to less psychological distress and depression, less verbal abuse, improved affective responsiveness, and social integration^[84]. Patients acceptance of the transplant and report of improved QOL is encouraging^[27], with additional psychosocial improvements after FTx (*e.g.*, return to work, *etc.*)^[82,84,141,143,144,146-148]. Two adaptive coping styles were common to almost all recipients, namely use of active coping and emotional support, and recipients reported normal to high self-esteem^[83]. Particularly, the rigorous preoperative psychosocial evaluation and follow-up of well selected candidates has led to an overwhelmingly positive psychological outcome^[27,149]. One exception is the non-adherent patient who used traditional medicinal approaches leading to multiple episodes of rejection and ultimately death^[27,142]. This highlights the need for careful patient selection, transplant health literacy, and careful ongoing monitoring for non-adherence following transplant^[27].

PSYCHOSOCIAL RESEARCH IN PENILE AND UTERINE TRANSPLANTATION

At present, the existing literature on psychosocial

evaluation and outcomes in PTx and UTx is limited and these still experimental surgical procedures have been performed in small numbers of patients. However in the field of PTx and UTx there exists the scientific consensus that psychosocial factors are important and the psychosocial evaluation is crucial for all candidates considering transplantation. By considering the already developed psychosocial evaluation and follow-up protocols for other VCA populations, *e.g.*, of hand(s) as well as face, almost the identical psychosocial aspects are of great importance. Nevertheless there are specific psychosocial aspects that are characteristic for PTx and UTx. Particularly, the function of physical intimacy of the allograft is one great difference and the motivation for PTx or UTx can emerge from the desire to restore bodily integrity, body image concerns, and even the hope to get pregnant/to beget a child, *etc.*^[150,151]. In case of UTx, moreover, the graft will not be for lifelong use and will be removed after the patient has had a limited number of children^[38,39], which may result in the recipient having limited time to partly adapt to the post-transplant regimen^[150].

Currently, the Swedish uterus transplant experience presents the most established VCA program for female candidates considering UTx^[38], and this was derived from a previously created face transplant protocol^[152]. The colleagues from the Sahlgrenska University of Gothenburg have developed a standardized evaluation protocol that uses a comprehensive pre-transplantation selection process that determines the suitability of the candidates and donors (*e.g.*, including psychological questionnaires regarding QOL and mood as well as semi-structured interviews with partners) and identifies potential vulnerabilities that need additional supportive treatment. Both the candidates and donors are assessed for psychiatric disorders, chemical dependency, social support, interpersonal conflicts, unrealistic expectations, and other factors related to lifestyle^[150].

Nine UTx have been performed, with two grafts removed in the first few months^[39,150]. The other seven women adapted well and following the initiation of menses, expressed relief in organ function and happiness about having a return to possible reproductivity. According to the follow-up outcomes 6 mo after UTx, the couples reported readjustment to baseline QOL and satisfactory sexual experience (no difference in sexual function or satisfaction). Despite the couples feeling well prepared and well informed about complications, couples with graft failure and subsequent removal had worse physical and psychological outcomes. Recipient-donor relationships returned to their pre-transplant state, which occurred more quickly with mothers/daughter pairs. However, the recipients who received a graft from someone other than their mother felt guilt related to an increased sense of responsibility to the donor^[150]. Finally, the Swedish UTx program highlights the importance of a multifaceted evaluation strategy and

that the evaluation should include identifying adaptive coping strategies and a strong alliance characterized by assertive and fluid communication with the transplant team^[38].

Penile defect is rare and only two cases of PTx are documented in the international literature^[151,153]. Although, the currently existing data of psychosocial aspects in PTx is limited, we can hypothesize that the psychosocial evaluation and follow-up are equally crucial as for any other life-enhancing types of VCA. The first case of PTx occurred in a 44-year-old male with previous trauma of the penis. Following transplant, the penis had to be removed because of psychological problems between the patients and his spouse at day 14 postoperatively^[151]. The psychological consequences of PTx showed that it is not easy to use and permanently see the allograft that was derived from a dead person. Nevertheless, in December 2014 a successful PTx was performed on a 21-year-old man following an unsuccessful circumcision procedure at age 18. Currently, the results of the psychological evaluation and follow-up were not reported, but the recipient previously had threatened to commit suicide if not considered for PTx^[153]. According to latest media reports, the recipient has in the meantime successfully conceived a child^[30].

ROLE OF MULTICENTER RESEARCH

Because there is still a lack of quantifiable data in the field of VCA^[40] and the inhomogeneous psychosocial protocols that have been developed from the transplant centers worldwide^[3,40], we feel strongly that our understanding of psychosocial predictors of outcomes will only be identified when sufficient numbers of patients are studied in multicenter research protocols^[3,154]. Because VCA is still uncommon, candidates who agree to undergo the surgery may be atypical in ways that are difficult to appreciate. Hence, it is recommended that transplant centers consider selecting several assessment and follow-up protocols to be administered collaboratively and consistently to all VCA recipients to strengthen and deepen our knowledge about psychosocial issues in VCA^[83,132], including prospective measurements across the continuum of time points from pre to post transplant^[3]. Therefore, it will be important that all transplant teams adhere to well-defined psychosocial guidelines and provide necessary multidisciplinary expertise^[6]. In addition, quality improvement strategies and qualitative research as well as demonstrable improvements in efficacy and financial cost offsets should take place^[3,67]. Once this occurs, VCA will become increasingly attractive to patients, insurance providers, and the medical community^[6].

CONCLUSION

In modern multidisciplinary transplantation medicine

the four areas of VCA (to date hands and faces have been transplanted in larger numbers, but also penile and uterine transplantations have occurred) represent an evolving field^[155] where psychosocial factors are important in successful outcomes^[3,40,48,49]. This review contrasted VCA with SOT and provided information to guide psychosocial selection and risk-benefit assessment of VCA candidates^[1,4]. VCA is primarily a life-enhancing procedure to improve the recipients' QOL and psychological well-being. The candidates' motivation for VCA is multifaceted and fundamentally different from SOT^[3,48].

Although it is clear that successful outcome requires a multi-staged multi-disciplinary psychosocial process to select candidates best equipped for VCA^[3], standardized evaluations have not been determined^[40,48]. Collaborative research on psychosocial predictors of outcome is needed^[3]. Additionally interventions to enhance the coping strategies of candidates and support their innate resilience are needed for them to best adapt to post transplant life^[3,49,156-158]. Thoughtful consideration of ethical challenges related to informed consent and the balance of autonomy and nonmaleficence is needed and future collaboration with experts in biomedical ethics is welcomed. We support and are involved in the development of multidisciplinary/-multicenter VCA research to identify psychosocial factors that can impact outcomes following VCA and will lead to further improvements for this patient population^[3,40,49].

REFERENCES

- 1 **Dubernard JM**. Hand and face allografts: myth, dream, and reality. *Proc Am Philos Soc* 2011; **155**: 13-22 [PMID: 21936198]
- 2 **Feroohar A**, Elliott RM, Kim TW, Breidenbach W, Shaked A, Levin LS. The history and evolution of hand transplantation. *Hand Clin* 2011; **27**: 405-409, vii [PMID: 22051381 DOI: 10.1016/j.hcl.2011.07.005]
- 3 **Kumnig M**, Jowsey SG, DiMartini AF. Psychological aspects of hand transplantation. *Curr Opin Organ Transplant* 2014; **19**: 188-195 [PMID: 24503494 DOI: 10.1097/MOT.0000000000000047]
- 4 **Tobin GR**, Breidenbach WC, Pidwell DJ, Ildstad ST, Ravindra KV. Transplantation of the hand, face, and composite structures: evolution and current status. *Clin Plast Surg* 2007; **34**: 271-278, ix-x [PMID: 17418676 DOI: 10.1016/j.cps.2007.01.001]
- 5 **Tobin GR**, Breidenbach WC, Ildstad ST, Marvin MM, Buell JF, Ravindra KV. The history of human composite tissue allotransplantation. *Transplant Proc* 2009; **41**: 466-471 [PMID: 19328905 DOI: 10.1016/j.transproceed.2009.01.026]
- 6 **Gander B**, Brown CS, Vasilic D, Furr A, Banis JC, Cunningham M, Wiggins O, Maldonado C, Whitaker I, Perez-Abadia G, Frank JM, Barker JH. Composite tissue allotransplantation of the hand and face: a new frontier in transplant and reconstructive surgery. *Transpl Int* 2006; **19**: 868-880 [PMID: 17018121 DOI: 10.1111/j.1432-2277.2006.00371.x]
- 7 **Da Varagine J**. *Leggenda aurea*. Florence, Italy: Libreria Editrice Fiorentina, 1952
- 8 **Barker CF**, Markmann JF. Historical overview of transplantation. *Cold Spring Harb Perspect Med* 2013; **3**: a014977 [PMID: 23545575 DOI: 10.1101/cshperspect.a014977]
- 9 **Bunger C**. Gelungener Versuch einer Nasenbildung aus einem völlig getrennten Hautstück aus dem Beine. *J Chir Augenheilk* 1823; **4**: 569
- 10 **Carrel A**. Landmark article, Nov 14, 1908: Results of the transplantation of blood vessels, organs and limbs. By Alexis Carrel. *JAMA* 1983; **250**: 944-953 [PMID: 6345837]
- 11 **Toledo-Pereyra LH**. Classics of modern surgery: the unknown man of Alexis Carrel-- father of transplantation. *J Invest Surg* 2003; **16**: 243-246 [PMID: 14527882]
- 12 **Guthrie CC**. *Blood-vessel surgery and its applications*. New York: Longman Green, 1912
- 13 **Whitaker IS**, Duggan EM, Alloway RR, Brown C, McGuire S, Woodle ES, Hsiao EC, Maldonado C, Banis JC, Barker JH. Composite tissue allotransplantation: a review of relevant immunological issues for plastic surgeons. *J Plast Reconstr Aesthet Surg* 2008; **61**: 481-492 [PMID: 18248779 DOI: 10.1016/j.bjps.2007.11.019]
- 14 **Billingham RE**, Brent L, Medawar PB. Actively acquired tolerance of foreign cells. *Nature* 1953; **172**: 603-606 [PMID: 13099277]
- 15 **Starzl TE**. Peter Brian Medawar: father of transplantation. *J Am Coll Surg* 1995; **180**: 332-336 [PMID: 7874344]
- 16 **Peacock EE**. Homologous composite tissue grafts of the digital flexor mechanism in human beings. *Transplant Bull* 1960; **7**: 418-421 [PMID: 14431204]
- 17 **Peacock EE**, Madden JW. Human composite flexor tendon allografts. *Ann Surg* 1967; **166**: 624-629 [PMID: 6061544]
- 18 **Gilbert R**. Transplant is successful with a cadaver forearm. *Med Trib Med News* 1964; **5**: 20-23
- 19 **Dubernard JM**, Owen E, Herzberg G, Martin X, Guigal V, Dawahra M, Pasticier G, Mongin-Long D, Kopp C, Ostapetz A, Lanzetta M, Kapila H, Hakim N. The first transplantation of a hand in humans. Early results. *Chirurgie* 1999; **124**: 358-365; discussion 365-367 [PMID: 10546388 DOI: 10.1016/S0001-4001(00)80007-0]
- 20 **Dubernard JM**, Owen E, Herzberg G, Lanzetta M, Martin X, Kapila H, Dawahra M, Hakim NS. Human hand allograft: report on first 6 months. *Lancet* 1999; **353**: 1315-1320 [PMID: 10218530 DOI: 10.1016/S0140-6736(99)02062-0]
- 21 **Dubernard JM**, Owen E, Lefrancois N, Petruzzo P, Martin X, Dawahra M, Jullien D, Kanitakis J. First human hand transplantation. *Am J Transplant* 2000; **13**: S521-S524
- 22 **Jones JW**, Gruber SA, Barker JH, Breidenbach WC. Successful hand transplantation. One-year follow-up. Louisville Hand Transplant Team. *N Engl J Med* 2000; **343**: 468-473 [PMID: 10950668 DOI: 10.1056/NEJM200008173430704]
- 23 **Lanzetta M**, Petruzzo P, Margreiter R, Dubernard JM, Schuind F, Breidenbach WC, Lucchini G, Schneeberger S, Van Holder C. The International Registry on Hand and Composite Tissue Transplantation (IRHCTT). Milan: Springer, 2007: 477-482 [DOI: 10.1007/978-88-470-0374-3_58]
- 24 **Jiang HQ**, Wang Y, Hu XB, Li YS, Li JS. Composite tissue allograft transplantation of cephalocervical skin flap and two ears. *Plast Reconstr Surg* 2005; **115**: 31e-35e; discussion 36e-37e [PMID: 15731658 DOI: 10.1097/01.PRS.0000153038.31865.02]
- 25 **Wamke P**. The first facial transplant. *Lancet* 2005; **366**: 1984 [PMID: 16338435]
- 26 Chinese Face op Man Doing Well. 2006. [accessed 2006 May 6]. Available from: URL: <http://news.bbc.co.uk/1/hi/world/asia-pacific/4915290.stm>
- 27 **Khalifian S**, Brazio PS, Mohan R, Shaffer C, Brandacher G, Barth RN, Rodriguez ED. Facial transplantation: the first 9 years. *Lancet* 2014; **384**: 2153-2163 [PMID: 24783986 DOI: 10.1016/S0140-6736(13)62632-X]
- 28 **Eberli D**, Susaeta R, Yoo JJ, Atala A. A method to improve cellular content for corporal tissue engineering. *Tissue Eng Part A* 2008; **14**: 1581-1589 [PMID: 18433315 DOI: 10.1089/tea.2007.0249]
- 29 **Netto J**. Doctors claim first successful penis transplant. 2015. [accessed 2015 Jul 13]. Available from: URL: <http://edition.cnn.com/2015/03/13/health/penis-transplant-south-africa/>
- 30 **Pearson M**, Goldschmidt D. First penis transplant patient's girlfriend is pregnant, doctor says. 2015. [Accessed 2015 Jul 13]. Available from: URL: <http://edition.cnn.com/2015/06/12/health/penis-transplant-south-africa-pregnancy/>
- 31 **Herftoft P**, Sørensen T. Transsexuality: some remarks based on clinical experience. *Ciba Found Symp* 1978; **62**: 165-181 [PMID:

- 256828]
- 32 **Confino E**, Vermesh M, Thomas W, Gleicher N. Non-vascular transplantation of the rabbit uterus. *Int J Gynaecol Obstet* 1986; **24**: 321-325 [PMID: 2878843 DOI: 10.1016/0020-7292(86)90091-3]
 - 33 **Kandela P**. Uterine transplantation failure causes Saudi Arabian government clampdown. *Lancet* 2000; **356**: 838 [PMID: 11022939]
 - 34 **Fageeh W**, Raffa H, Jabbad H, Marzouki A. Transplantation of the human uterus. *Int J Gynaecol Obstet* 2002; **76**: 245-251 [PMID: 11880127 DOI: 10.1016/S0020-7292(01)00597-5]
 - 35 **Ozkan O**, Akar ME, Ozkan O, Erdogan O, Hadimioglu N, Yilmaz M, Gunseren F, Cincik M, Pestereli E, Kocak H, Mutlu D, Dinckan A, Gecici O, Bektas G, Suleymanlar G. Preliminary results of the first human uterus transplantation from a multiorgan donor. *Fertil Steril* 2013; **99**: 470-476 [PMID: 23084266 DOI: 10.1016/j.fertnstert.2012.09.035]
 - 36 **Erman Akar M**, Ozkan O, Aydinuraz B, Dirican K, Cincik M, Mendilcioglu I, Simsek M, Gunseren F, Kocak H, Ciftcioglu A, Gecici O, Ozkan O. Clinical pregnancy after uterus transplantation. *Fertil Steril* 2013; **100**: 1358-1363 [PMID: 23830110 DOI: 10.1016/j.fertnstert.2013.06.027]
 - 37 **Johannesson L**, Kvarnström N, Mölne J, Dahm-Kähler P, Enskog A, Diaz-Garcia C, Olausson M, Brännström M. Uterus transplantation trial: 1-year outcome. *Fertil Steril* 2015; **103**: 199-204 [PMID: 25439846 DOI: 10.1016/j.fertnstert.2014.09.024]
 - 38 **Brännström M**. The Swedish uterus transplantation project: the story behind the Swedish uterus transplantation project. *Acta Obstet Gynecol Scand* 2015; **94**: 675-679 [PMID: 25958784 DOI: 10.1111/aogs.12661]
 - 39 **Brännström M**, Johannesson L, Bokström H, Kvarnström N, Mölne J, Dahm-Kähler P, Enskog A, Milenkovic M, Ekberg J, Diaz-Garcia C, Gäbel M, Hanafy A, Hagberg H, Olausson M, Nilsson L. Livebirth after uterus transplantation. *Lancet* 2015; **385**: 607-616 [PMID: 25301505 DOI: 10.1016/S0140-6736(14)61728-1]
 - 40 **Kumnig M**, Jowsey SG, Moreno E, Brandacher G, Azari K, Rumpold G. An overview of psychosocial assessment procedures in reconstructive hand transplantation. *Transpl Int* 2014; **27**: 417-427 [PMID: 24164333 DOI: 10.1111/tri.12220]
 - 41 **Klapheke MM**, Marcell C, Taliaferro G, Creamer B. Psychiatric assessment of candidates for hand transplantation. *Microsurgery* 2000; **20**: 453-457 [PMID: 11150999 DOI: 10.1002/1098-2752(2000)20:8<453::AID-MICR18>3.0.CO;2-Y]
 - 42 **Carosella ED**, Pradeu T. Transplantation and identity: a dangerous split? *Lancet* 2006; **368**: 183-184 [PMID: 16844470]
 - 43 **Streisand RM**, Rodrigue JR, Sears SF, Perri MG, Davis GL, Banko CG. A psychometric normative database for pre-liver transplantation evaluations. The Florida cohort 1991-1996. *Psychosomatics* 1999; **40**: 479-485 [PMID: 10581975 DOI: 10.1016/s0033-3182(99)71185-0]
 - 44 **Cherkasky L**. A fair trial? Assessment of liver transplant candidates with psychiatric illnesses. *J Med Ethics* 2011; **37**: 739-742 [PMID: 21947809 DOI: 10.1136/jme.2011.042556]
 - 45 **Petruzzo P**, Lanzetta M, Dubernard JM, Margreiter R, Schuind F, Breidenbach W, Noll R, Schneeberger S, van Holder C, Kaufman C, Jablecki J, Landin L, Cavadas P. The international registry on hand and composite tissue transplantation. *Transplantation* 2008; **86**: 487-492 [PMID: 18724213 DOI: 10.1097/TP.0b013e318181f8e8]
 - 46 **Lanzetta M**, Petruzzo P, Dubernard JM, Margreiter R, Schuind F, Breidenbach W, Noll R, Schneeberger S, van Holder C, Gorantla VS, Pei G, Zhao J, Zhang X. Second report (1998-2006) of the International Registry of Hand and Composite Tissue Transplantation. *Transpl Immunol* 2007; **18**: 1-6 [PMID: 17584595 DOI: 10.1016/j.trim.2007.03.002]
 - 47 **Lanzetta M**, Petruzzo P, Margreiter R, Dubernard JM, Schuind F, Breidenbach W, Lucchina S, Schneeberger S, van Holder C, Granger D, Pei G, Zhao J, Zhang X. The International Registry on Hand and Composite Tissue Transplantation. *Transplantation* 2005; **79**: 1210-1214 [PMID: 15880072]
 - 48 **Shores JT**. Recipient screening and selection: who is the right candidate for hand transplantation. *Hand Clin* 2011; **27**: 539-543, x [PMID: 22051394 DOI: 10.1016/j.hcl.2011.07.009]
 - 49 **Kumnig M**, Jowsey SG, Rumpold G, Weissenbacher A, Hautz T, Engelhardt TO, Brandacher G, Gabl M, Ninkovic M, Rieger M, Zelger B, Zelger B, Blauth M, Margreiter R, Pierer G, Pratschke J, Schneeberger S. The psychological assessment of candidates for reconstructive hand transplantation. *Transpl Int* 2012; **25**: 573-585 [PMID: 22448727 DOI: 10.1111/j.1432-2277.2012.01463.x]
 - 50 **Simmons PD**. Ethical considerations in composite tissue allotransplantation. *Microsurgery* 2000; **20**: 458-465 [PMID: 11151000]
 - 51 **Tobin GR**, Breidenbach WC, Klapheke MM, Bentley FR, Pidwell DJ, Simmons PD. Ethical considerations in the early composite tissue allograft experience: a review of the Louisville Ethics Program. *Transplant Proc* 2005; **37**: 1392-1395 [PMID: 15848730 DOI: 10.1016/j.transproceed.2004.12.179]
 - 52 **Baylis F**. A face is not just like a hand: pace Barker. *Am J Bioeth* 2004; **4**: 30-32; discussion W23-W31 [PMID: 16192132 DOI: 10.1080/15265160490496804]
 - 53 **Bramstedt KA**. Informed Consent for Facial Transplantation. In: Siemionow M, editor. *The Know How of Facial Transplantation*. London: Springer, 2011: 255-260
 - 54 **Coffman KL**, Siemionow MZ. Ethics of facial transplantation revisited. *Curr Opin Organ Transplant* 2014; **19**: 181-187 [PMID: 24565957 DOI: 10.1097/MOT.000000000000058]
 - 55 **Lanzetta M**, Noll R, Borgonovo A, Owen ER, Dubernard JM, Kapila H, Martin X, Hakim N, Dawahra M. Hand transplantation: ethics, immunosuppression and indications. *J Hand Surg Br* 2001; **26**: 511-516 [PMID: 11884098 DOI: 10.1054/jhsb.2001.0635]
 - 56 **Dickenson D**, Widdershoven G. Ethical issues in limb transplants. *Bioethics* 2001; **15**: 110-124 [PMID: 11697376 DOI: 10.1111/1467-8519.00219]
 - 57 **Lefkowitz A**, Edwards M, Balayla J. Ethical considerations in the era of the uterine transplant: an update of the Montreal Criteria for the Ethical Feasibility of Uterine Transplantation. *Fertil Steril* 2013; **100**: 924-926 [PMID: 23768985 DOI: 10.1016/j.fertnstert.2013.05.026]
 - 58 **Shores JT**, Brandacher G, Schneeberger S, Gorantla VS, Lee WP. Composite tissue allotransplantation: hand transplantation and beyond. *J Am Acad Orthop Surg* 2010; **18**: 127-131 [PMID: 20190102]
 - 59 **Siegler M**. Ethical issues in innovative surgery: should we attempt a cadaveric hand transplantation in a human subject? *Transplant Proc* 1998; **30**: 2779-2782 [PMID: 9745565 DOI: 10.1016/S0041-1345(98)00807-0]
 - 60 **Moore FD**. Three ethical revolutions: ancient assumptions remodeled under pressure of transplantation. *Transplant Proc* 1988; **20**: 1061-1067 [PMID: 3279601]
 - 61 **Sicard D**. Ethical aspects of non-life-saving allografts with special regard to the hand. In: Lanzetta M, Dubernard JM, Petruzzo P, editors. *Hand Transplantation*. Mi-lan: Springer, 2011: 107-109
 - 62 **Brenner MJ**, Tung TH, Jensen JN, Mackinnon SE. The spectrum of complications of immunosuppression: is the time right for hand transplantation? *J Bone Joint Surg Am* 2002; **84-A**: 1861-1870 [PMID: 12377920]
 - 63 **Petruzzo P**, Lanzetta M, Dubernard JM, Landin L, Cavadas P, Margreiter R, Schneeberger S, Breidenbach W, Kaufman C, Jablecki J, Schuind F, Dumontier C. The International Registry on Hand and Composite Tissue Transplantation. *Transplantation* 2010; **90**: 1590-1594 [PMID: 21052038 DOI: 10.1097/TP.0b013e3181ff1472]
 - 64 International Registry on Hand Composite Tissue Transplantation 2013. [Accessed 2013 Nov 27]. Available from: URL: <http://www.handregistry.com/>
 - 65 **Kalluri HV**, Hardinger KL. Current state of renal transplant immunosuppression: Present and future. *World J Transplant* 2012; **2**: 51-68 [PMID: 24175197 DOI: 10.5500/wjt.v2.i4.51]
 - 66 **Brouha P**, Naidu D, Cunningham M, Furr A, Majzoub R, Grossi FV, Francois CG, Maldonado C, Banis JC, Martinez S, Perez-Abadia G, Wiggins O, Kon M, Barker JH. Risk acceptance in composite-tissue allotransplantation reconstructive procedures. *Microsurgery* 2006; **26**: 144-149; discussion 149-150 [PMID: 16518801]
 - 67 **Shores JT**, Imbriglia JE, Lee WP. The current state of hand transplantation. *J Hand Surg Am* 2011; **36**: 1862-1867 [PMID: 22036285 DOI: 10.1016/j.jhsa.2011.09.001]

- 68 **Schneeberger S**, Landin L, Jableki J, Butler P, Hoehnke C, Brandacher G, Morelon E. Achievements and challenges in composite tissue allotransplantation. *Transpl Int* 2011; **24**: 760-769 [PMID: 21554424 DOI: 10.1111/j.1432-2277.2011.01261.x]
- 69 **Petit F**, Minns AB, Dubernard JM, Hettiaratchy S, Lee WP. Composite tissue allotransplantation and reconstructive surgery: first clinical applications. *Ann Surg* 2003; **237**: 19-25 [PMID: 12496526]
- 70 **Hautz T**, Brandacher G, Zelger B, Gorantla VS, Lee AW, Pratschke J, Schneeberger S. Immunologic aspects and rejection in solid organ versus reconstructive transplantation. *Transplant Proc* 2010; **42**: 3347-3353 [PMID: 21094778 DOI: 10.1016/j.transproceed.2010.09.020]
- 71 **Wu S**, Xu H, Ravindra K, Ildstad ST. Composite tissue allotransplantation: past, present and future—the history and expanding applications of CTA as a new frontier in transplantation. *Transplant Proc* 2009; **41**: 463-465 [PMID: 19328904 DOI: 10.1016/j.transproceed.2009.01.027]
- 72 **Hettiaratchy S**, Randolph MA, Petit F, Lee WP, Butler PE. Composite tissue allotransplantation—a new era in plastic surgery? *Br J Plast Surg* 2004; **57**: 381-391 [PMID: 15191817 DOI: 10.1016/j.bjps.2004.02.012]
- 73 **Ravindra KV**, Wu S, McKinney M, Xu H, Ildstad ST. Composite tissue allotransplantation: current challenges. *Transplant Proc* 2009; **41**: 3519-3528 [PMID: 19917338 DOI: 10.1016/j.transproceed.2009.08.052]
- 74 **Thaunat O**, Badet L, El-Jaafari A, Kanitakis J, Dubernard JM, Morelon E. Composite tissue allograft extends a helping hand to transplant immunologists. *Am J Transplant* 2006; **6**: 2238-2242 [PMID: 16889601]
- 75 **Barker JH**, Allen F, Cunningham M, Basappa PS, Wiggins O, Banis Jr JC, Alloway RR, Woodle ES, Frank JM. Risk assessment and management in hand and facial tissue transplantation. *Eur J Trauma Emerg S* 2011; **37**: 469-476 [DOI: 10.1007/s00068-011-0131-4]
- 76 **Cunningham M**, Majzoub R, Brouha PCR, Naidu DK, Maldonado C. Risk acceptance in composite tissue allotransplantation reconstructive procedures: Instrument design and validation. *Eur J Trauma Emerg S* 2004; **30**: 12-16 [DOI: 10.1007/s00068-004-1369-x]
- 77 **Majzoub RK**, Cunningham M, Grossi F, Maldonado C, Banis JC, Barker JH. Investigation of risk acceptance in hand transplantation. *J Hand Surg Am* 2006; **31**: 295-302 [PMID: 16473694 DOI: 10.1016/j.jhssa.2005.09.013]
- 78 **Balassubramanian G**, McKitty K, Fan SL. Comparing automated peritoneal dialysis with continuous ambulatory peritoneal dialysis: survival and quality of life differences? *Nephrol Dial Transplant* 2011; **26**: 1702-1708 [PMID: 20921296 DOI: 10.1093/ndt/gfq607]
- 79 **Kanitakis J**, Jullien D, Petruzzo P, Hakim N, Claudy A, Revillard JP, Owen E, Dubernard JM. Clinicopathologic features of graft rejection of the first human hand allograft. *Transplantation* 2003; **76**: 688-693 [PMID: 12973110]
- 80 **Landin L**, Cavadas PC, Ibañez J, Roger I. Malignant skin tumor in a composite tissue (bilateral hand) allograft recipient. *Plast Reconstr Surg* 2010; **125**: 20e-21e [PMID: 20048584 DOI: 10.1097/PRS.0b013e3181c2a3e6]
- 81 **Coffman KL**, Siemionow MZ. Face transplantation: psychological outcomes at three-year follow-up. *Psychosomatics* 2013; **54**: 372-378 [PMID: 23352049 DOI: 10.1016/j.psym.2012.10.009]
- 82 **Devauchelle B**, Badet L, Lengelé B, Morelon E, Testelin S, Michallet M, D'Hauthuille C, Dubernard JM. First human face allograft: early report. *Lancet* 2006; **368**: 203-209 [PMID: 16844489 DOI: 10.1016/S0140-6736(06)68935-6]
- 83 **Chang G**, Pomahac B. Psychosocial changes 6 months after face transplantation. *Psychosomatics* 2013; **54**: 367-371 [PMID: 23194929 DOI: 10.1016/j.psym.2012.07.012]
- 84 **Lemmens GM**, Poppe C, Hendrickx H, Roche NA, Peeters PC, Vermeersch HF, Rogiers X, Lierde KV, Blondeel PN. Facial transplantation in a blind patient: psychologic, marital, and family outcomes at 15 months follow-up. *Psychosomatics* 2015; **56**: 362-370 [PMID: 26096323 DOI: 10.1016/j.psym.2014.05.002]
- 85 **Kisu I**, Mihara M, Banno K, Umene K, Araki J, Hara H, Suganuma N, Aoki D. Risks for donors in uterus transplantation. *Reprod Sci* 2013; **20**: 1406-1415 [PMID: 23793471 DOI: 10.1177/1933719113493517]
- 86 **Bachmann GA**. Hysterectomy. A critical review. *J Reprod Med* 1990; **35**: 839-862 [PMID: 2231559]
- 87 **Bachmann GA**. Psychosexual aspects of hysterectomy. *Womens Health Issues* 1990; **1**: 41-49 [PMID: 2136303 DOI: 10.1016/S1049-3867(05)80015-5]
- 88 **Sloan D**. The emotional and psychosexual aspects of hysterectomy. *Am J Obstet Gynecol* 1978; **131**: 598-605 [PMID: 686046]
- 89 **Parikh ND**, Ladner D, Abecassis M, Butt Z. Quality of life for donors after living donor liver transplantation: a review of the literature. *Liver Transpl* 2010; **16**: 1352-1358 [PMID: 21117194 DOI: 10.1002/lt.22181]
- 90 **Verbese JE**, Simpson MA, Pomposelli JJ, Richman E, Bracken AM, Garrigan K, Chang H, Jenkins RL, Pomfret EA. Living donor adult liver transplantation: a longitudinal study of the donor's quality of life. *Am J Transplant* 2005; **5**: 2770-2777 [PMID: 16212639]
- 91 **Miyagi S**, Kawagishi N, Fujimori K, Sekiguchi S, Fukumori T, Akamatsu Y, Satomi S. Risks of donation and quality of donors' life after living donor liver transplantation. *Transpl Int* 2005; **18**: 47-51 [PMID: 15612983 DOI: 10.1111/j.1432-2277.2004.00028.x]
- 92 **Kim-Schluger L**, Florman SS, Schiano T, O'Rourke M, Gagliardi R, Drooker M, Emre S, Fishbein TM, Sheiner PA, Schwartz ME, Miller CM. Quality of life after lobectomy for adult liver transplantation. *Transplantation* 2002; **73**: 1593-1597 [PMID: 12042645]
- 93 **Bellerose SB**, Binik YM. Body image and sexuality in oophorectomized women. *Arch Sex Behav* 1993; **22**: 435-459 [PMID: 8239974]
- 94 **Nathorst-Böös J**, Fuchs T, von Schoultz B. Consumer's attitude to hysterectomy. The experience of 678 women. *Acta Obstet Gynecol Scand* 1992; **71**: 230-234 [PMID: 1317649]
- 95 **Ethics Committee of the Transplantation Society**. The consensus statement of the Amsterdam Forum on the Care of the Live Kidney Donor. *Transplantation* 2004; **78**: 491-492 [PMID: 15446304 DOI: 10.1097/01.TP.0000136654.85459.1E]
- 96 **Abecassis M**, Adams M, Adams P, Arnold RM, Atkins CR, Barr ML, Bennett WM, Bia M, Briscoe DM, Burdick J, Corry RJ, Davis J, Delmonico FL, Gaston RS, Harmon W, Jacobs CL, Kahn J, Leichtman A, Miller C, Moss D, Newmann JM, Rosen LS, Siminoff L, Spital A, Starnes VA, Thomas C, Tyler LS, Williams L, Wright FH, Youngner S. Consensus statement on the live organ donor. *JAMA* 2000; **284**: 2919-2926 [PMID: 11187711]
- 97 **Breidenbach WC**, Gonzales NR, Kaufman CL, Klapheke M, Tobin GR, Gorantla VS. Outcomes of the first 2 American hand transplants at 8 and 6 years posttransplant. *J Hand Surg Am* 2008; **33**: 1039-1047 [PMID: 18762094 DOI: 10.1016/j.jhssa.2008.02.015]
- 98 **Breidenbach WC**, Tobin GR, Gorantla VS, Gonzalez RN, Granger DK. A position statement in support of hand transplantation. *J Hand Surg Am* 2002; **27**: 760-770 [PMID: 12239664]
- 99 **Carta I**, Convertino O, Cornaggia CM. Psychological investigation protocol of candidates for hand transplantation. *Transplant Proc* 2001; **33**: 621-622 [PMID: 11266987 DOI: 10.1016/S0041-1345(00)02171-0]
- 100 **Dubernard JM**, Petruzzo P, Lanzetta M, Parmentier H, Martin X, Dawahra M, Hakim NS, Owen E. Functional results of the first human double-hand transplantation. *Ann Surg* 2003; **238**: 128-136 [PMID: 12832975 DOI: 10.1097/01.SLA.0000078945.70869.82]
- 101 **Hautz T**, Engelhardt TO, Weissenbacher A, Kumnig M, Zelger B, Rieger M, Rumpold G, Pierer G, Ninkovic M, Gabl M, Piza-Katzer H, Pratschke J, Margreiter R, Brandacher G, Schneeberger S. World experience after more than a decade of clinical hand transplantation: update on the Innsbruck program. *Hand Clin* 2011; **27**: 423-431, viii [PMID: 22051384 DOI: 10.1016/j.hcl.2011.07.004]
- 102 **Jablecki J**. World experience after more than a decade of clinical hand transplantation: update on the Polish program. *Hand Clin* 2011; **27**: 433-442, viii [PMID: 22051385 DOI: 10.1016/j.hcl.2011.08.003]
- 103 **Landin L**, Cavadas PC, Nthumba P, Muñoz G, Gallego R, Belloch V, Avila C, Loro M, Ibañez J, Roger I, Linares-Martinez N. Morphological and functional evaluation of visual disturbances in a

- bilateral hand allograft recipient. *J Plast Reconstr Aesthet Surg* 2010; **63**: 700-704 [PMID: 19237332 DOI: 10.1016/j.bjps.2008.12.033]
- 104 **Schuind F**, Van Holder C, Mouraux D, Robert C, Meyer A, Salvia P, Vermeulen N, Abramowicz D. [The first Belgian hand transplantation case. Nine years follow-up]. *Rev Med Brux* 2011; **32**: S66-S70 [PMID: 22458060]
- 105 **Schuind F**, Van Holder C, Mouraux D, Robert Ch, Meyer A, Salvia P, Vermeulen N, Abramowicz D. The first Belgian hand transplantation--37 month term results. *J Hand Surg Br* 2006; **31**: 371-376 [PMID: 16527381 DOI: 10.1016/j.jhsb.2006.01.003]
- 106 **Zhu L**, Pei G, Gu L, Hong J. Psychological consequences derived during process of human hand allograft. *Chin Med J (Engl)* 2002; **115**: 1660-1663 [PMID: 12609083]
- 107 **Cavadas PC**, Landin L, Thione A, Rodríguez-Pérez JC, Garcia-Bello MA, Ibañez J, Vera-Sempere F, Garcia-Cosmes P, Alfaro L, Rodrigo JD, Castro F. The Spanish experience with hand, forearm, and arm transplantation. *Hand Clin* 2011; **27**: 443-453, viii [PMID: 22051386 DOI: 10.1016/j.hcl.2011.08.002]
- 108 **Cavadas PC**, Landin L, Ibañez J. Bilateral hand transplantation: result at 20 months. *J Hand Surg Eur Vol* 2009; **34**: 434-443 [PMID: 19395533 DOI: 10.1177/1753193409102898]
- 109 **Kaufman CL**, Blair B, Murphy E, Breidenbach WB. A new option for amputees: transplantation of the hand. *J Rehabil Res Dev* 2009; **46**: 395-404 [PMID: 19675991 DOI: 10.1682/JRRD.2008.08.0108]
- 110 **Margreiter R**, Brandacher G, Ninkovic M, Steurer W, Kreczy A, Schneeberger S. A double-hand transplant can be worth the effort! *Transplantation* 2002; **74**: 85-90 [PMID: 12134104 DOI: 10.1097/0007890-200207150-00015]
- 111 **Petruzzo P**, Dubernard JM. World experience after more than a decade of clinical hand transplantation: update on the French program. *Hand Clin* 2011; **27**: 411-416, vii [PMID: 22051382 DOI: 10.1016/j.hcl.2011.07.007]
- 112 **Petruzzo P**, Badet L, Gazarian A, Lanzetta M, Parmentier H, Kanitakis J, Sirigu A, Martin X, Dubernard JM. Bilateral hand transplantation: six years after the first case. *Am J Transplant* 2006; **6**: 1718-1724 [PMID: 16827876]
- 113 **Ravindra KV**, Buell JF, Kaufman CL, Blair B, Marvin M, Nagubandi R, Breidenbach WC. Hand transplantation in the United States: experience with 3 patients. *Surgery* 2008; **144**: 638-643; discussion 643-644 [PMID: 18847649 DOI: 10.1016/j.surg.2008.06.025]
- 114 **Day E**, Best D, Sweeting R, Russell R, Webb K, Georgiou G, Neuberger J. Predictors of psychological morbidity in liver transplant assessment candidates: is alcohol abuse or dependence a factor? *Transpl Int* 2009; **22**: 606-614 [PMID: 19207190 DOI: 10.1111/j.1432-2277.2009.00835.x]
- 115 **Feurer ID**, Russell RT, Pinson CW. Incorporating quality of life and patient satisfaction measures into a transplant outcomes assessment program: technical and practical considerations. *Prog Transplant* 2007; **17**: 121-128 [PMID: 17624134 DOI: 10.7182/prtr.17.2.x618p 51851255362]
- 116 **Fukunishi I**, Sugawara Y, Takayama T, Makuuchi M, Kawarasaki H, Surman OS. Association between pretransplant psychological assessments and posttransplant psychiatric disorders in living-related transplantation. *Psychosomatics* 2002; **43**: 49-54 [PMID: 11927758 DOI: 10.1176/appi.psy.43.1.49]
- 117 **Mascoloni SE**, Marquez MF, Diez M, Berlolotti AM, Favaloro RR. Pretransplant psychological risk evaluation strongly predicts mortality after cardiac transplantation. *J Heart Lung Transpl* 2006; **25**: S153-S153 [DOI: 10.1016/j.healun.2005.11.327]
- 118 **Owen JE**, Bonds CL, Wellisch DK. Psychiatric evaluations of heart transplant candidates: predicting post-transplant hospitalizations, rejection episodes, and survival. *Psychosomatics* 2006; **47**: 213-222 [PMID: 16684938 DOI: 10.1176/appi.psy.47.3.213]
- 119 **Pascher A**, Sauer IM, Walter M, Lopez-Haeninnen E, Theruvath T, Spinelli A, Neuhaus R, Settmacher U, Mueller AR, Steinmueller T, Neuhaus P. Donor evaluation, donor risks, donor outcome, and donor quality of life in adult-to-adult living donor liver transplantation. *Liver Transpl* 2002; **8**: 829-837 [PMID: 12200786 DOI: 10.1053/jlts.2002.34896]
- 120 **Sainz-Barriga M**, Baccarani U, Scudeller L, Risaliti A, Toniutto PL, Costa MG, Ballestreri M, Adani GL, Lorenzin D, Bresadola V, Ramacciato G, Bresadola F. Quality-of-life assessment before and after liver transplantation. *Transplant Proc* 2005; **37**: 2601-2604 [PMID: 16182758 DOI: 10.1016/j.transproceed.2005.06.045]
- 121 **von Steinbuchel N**, Limm H, Leopold C, Carr D. Assessment of health-related quality-of-life in patients after heart transplantation under therapy with tacrolimus or cyclosporine. *Transpl Int* 2000; **13** Suppl 1: S609-614 [DOI: 10.1111/j.1432-2277.2000.tb02117.x]
- 122 **Olbrisch ME**, Levenson JL, Hamer R. The PACT: A rating scale for the study of clinical decision-making in psychosocial screening of organ transplant candidates. *Clin Transplant* 1989; **3**: 164-169 [DOI: 10.1016/S0033-3182(95)71626-7]
- 123 **Twillman RK**, Manetto C, Wellisch DK, Wolcott DL. The Transplant Evaluation Rating Scale. A revision of the psychosocial levels system for evaluating organ transplant candidates. *Psychosomatics* 1993; **34**: 144-153 [PMID: 8456157 DOI: 10.1016/S0033-3182(93)71905-2]
- 124 **Maldonado JR**, Dubois HC, David EE, Sher Y, Lolak S, Dyal J, Witten D. The Stanford Integrated Psychosocial Assessment for Transplantation (SIPAT): a new tool for the psychosocial evaluation of pre-transplant candidates. *Psychosomatics* 2012; **53**: 123-132 [PMID: 22424160 DOI: 10.1016/j.psym.2011.12.012]
- 125 **Papachristu P**. Strategies for psychiatric-psychosomatic evaluation of organ donors and recipients: The European Experience. *J Psychosom Res* 2013; **74**: 555 [DOI: 10.1016/j.jpsychores.2013.03.067]
- 126 **Schuind F**, Abramowicz D, Schneeberger S. Hand transplantation: the state-of-the-art. *J Hand Surg Eur Vol* 2007; **32**: 2-17 [PMID: 17084950 DOI: 10.1016/j.jhsb.2006.09.008]
- 127 **Olbrisch ME**. Ethical issues in psychological evaluation of patients for organ transplant surgery. *Rehabil Psychol* 1996; **41**: 53-71 [DOI: 10.1037/0090-5550.41.1.53]
- 128 **Leo RJ**, Smith BA, Mori DL. Guidelines for conducting a psychiatric evaluation of the unrelated kidney donor. *Psychosomatics* 2003; **44**: 452-460 [PMID: 14597679 DOI: 10.1176/appi.psy.44.6.452]
- 129 **Sears SF**, Rodrigue JR, Greene AF, Mills RM. Predicting quality of life with a pretransplantation assessment battery: A prospective study of cardiac recipients. *J Clin Psychol Med Settings* 1995; **2**: 335-355 [PMID: 24226414 DOI: 10.1007/bf01991681]
- 130 **Dobbels F**, Vanhaecke J, Dupont L, Nevens F, Verleden G, Pirenne J, De Geest S. Pretransplant predictors of posttransplant adherence and clinical outcome: an evidence base for pretransplant psychosocial screening. *Transplantation* 2009; **87**: 1497-1504 [PMID: 19461486 DOI: 10.1097/TP.0b013e3181a440ae]
- 131 **Dew MA**, Jacobs CL, Jowsey SG, Hanto R, Miller C, Delmonico FL. Guidelines for the psychosocial evaluation of living unrelated kidney donors in the United States. *Am J Transplant* 2007; **7**: 1047-1054 [PMID: 17359510]
- 132 **Chang J**, Mathes DW. Ethical, financial, and policy considerations in hand transplantation. *Hand Clin* 2011; **27**: 553-560, xi [PMID: 22051396 DOI: 10.1016/j.hcl.2011.07.006]
- 133 **Furr LA**, Wiggins O, Cunningham M, Vasilic D, Brown CS, Bani JC, Maldonado C, Perez-Abadia G, Barker JH. Psychosocial implications of disfigurement and the future of human face transplantation. *Plast Reconstr Surg* 2007; **120**: 559-565 [PMID: 17632364 DOI: 10.1097/01.prs.0000267584.66732.e5]
- 134 **Coffman KL**, Gordon C, Siemionow M. Psychological outcomes with face transplantation: overview and case report. *Curr Opin Organ Transplant* 2010; **15**: 236-240 [PMID: 20308897 DOI: 10.1097/MOT.0b013e328337267d]
- 135 **De Sousa A**. Psychological issues in oral and maxillofacial reconstructive surgery. *Br J Oral Maxillofac Surg* 2008; **46**: 661-664 [PMID: 18771826 DOI: 10.1016/j.bjoms.2008.07.192]
- 136 **Coffman KL**, Gordon CR, Siemionow MZ. Psychological aspects of face transplantation. In Siemionow M, editor. The know-how of transplantation. New York: Springer, 2011: 139-150
- 137 **Thompson JK**, Cattarin J, Fowler B, Fisher E. The Perception of Teasing Scale (POTS): a revision and extension of the Physical

- Appearance Related Teasing Scale (PARTS). *J Pers Assess* 1995; **65**: 146-157 [PMID: 16367650]
- 138 **Gromel K**, Sargent RG, Watkins JA, Shoob HD, DiGioacchino RF, Malin AS. Measurements of body image in clinical weight loss participants with and without binge-eating traits. *Eat Behav* 2000; **1**: 191-202 [PMID: 15001061]
- 139 **Pomahac B**, Pribaz J, Eriksson E, Bueno EM, Diaz-Siso JR, Rybicki FJ, Annino DJ, Orgill D, Catterson EJ, Catterson SA, Carty MJ, Chun YS, Sampson CE, Janis JE, Alam DS, Saavedra A, Molnar JA, Edrich T, Marty FM, Tullius SG. Three patients with full facial transplantation. *N Engl J Med* 2012; **366**: 715-722 [PMID: 22204672 DOI: 10.1056/NEJMoa1111432]
- 140 **Meningaud JP**, Paraskevas A, Ingallina F, Bouhana E, Lantieri L. Face transplant graft procurement: a preclinical and clinical study. *Plast Reconstr Surg* 2008; **122**: 1383-1389 [PMID: 18971721 DOI: 10.1097/PRS.0b013e3181882146]
- 141 **Dubernard JM**, Lengel  B, Morelon E, Testelin S, Badet L, Moure C, Beziat JL, Dakp  S, Kanitakis J, D'Hauthuille C, El Jaafari A, Petruzzo P, Lefrancois N, Taha F, Sirigu A, Di Marco G, Carmi E, Bachmann D, Cremades S, Giroux P, Burloux G, Hequet O, Parquet N, Franc s C, Michallet M, Martin X, Devauchelle B. Outcomes 18 months after the first human partial face transplantation. *N Engl J Med* 2007; **357**: 2451-2460 [PMID: 18077810 DOI: 10.1056/NEJMoa072828]
- 142 **Gordon CR**, Siemionow M, Papay F, Pryor L, Gatherwright J, Kodish E, Paradis C, Coffman K, Mathes D, Schneeberger S, Losee J, Serletti JM, Hivelin M, Lantieri L, Zins JE. The world's experience with facial transplantation: what have we learned thus far? *Ann Plast Surg* 2009; **63**: 572-578 [PMID: 19806039 DOI: 10.1097/SAP.0b013e3181ba5245]
- 143 **Guo S**, Han Y, Zhang X, Lu B, Yi C, Zhang H, Ma X, Wang D, Yang L, Fan X, Liu Y, Lu K, Li H. Human facial allotransplantation: a 2-year follow-up study. *Lancet* 2008; **372**: 631-638 [PMID: 18722867 DOI: 10.1016/S0140-6736(08)61276-3]
- 144 **Lantieri L**, Hivelin M, Audard V, Benjoar MD, Meningaud JP, Bellivier F, Ortonne N, Lefaucheur JP, Gilton A, Suberbielle C, Marty J, Lang P, Grimbert P. Feasibility, reproducibility, risks and benefits of face transplantation: a prospective study of outcomes. *Am J Transplant* 2011; **11**: 367-378 [PMID: 21272240 DOI: 10.1111/j.1600-6143.2010.03406.x]
- 145 **Siemionow M**, Papay F, Alam D, Bernard S, Djohan R, Gordon C, Hendrickson M, Lohman R, Eghtesad B, Coffman K, Kodish E, Paradis C, Avery R, Fung J. Near-total human face transplantation for a severely disfigured patient in the USA. *Lancet* 2009; **374**: 203-209 [PMID: 19608265 DOI: 10.1016/S0140-6736(09)61155-7]
- 146 **Barret JP**, Gavalda J, Bueno J, Nuvials X, Pont T, Masnou N, Colomina MJ, Serracanta J, Arno A, Hugu t P, Collado JM, Salamero P, Moreno C, Deulofeu R, Mart nez-Ib n ez V. Full face transplant: the first case report. *Ann Surg* 2011; **254**: 252-256 [PMID: 21772126 DOI: 10.1097/SLA.0b013e318226a607]
- 147 **Lantieri L**, Meningaud JP, Grimbert P, Bellivier F, Lefaucheur JP, Ortonne N, Benjoar MD, Lang P, Wolkstein P. Repair of the lower and middle parts of the face by composite tissue allotransplantation in a patient with massive plexiform neurofibroma: a 1-year follow-up study. *Lancet* 2008; **372**: 639-645 [PMID: 18722868 DOI: 10.1016/S0140-6736(08)61277-5]
- 148 **Singhal D**, Pribaz JJ, Pomahac B. The Brigham and Women's Hospital face transplant program: a look back. *Plast Reconstr Surg* 2012; **129**: 81e-88e [PMID: 22186587 DOI: 10.1097/PRS.0b013e31823621db]
- 149 **Siemionow MZ**, Gordon CR. Institutional review board-based recommendations for medical institutions pursuing protocol approval for facial transplantation. *Plast Reconstr Surg* 2010; **126**: 1232-1239 [PMID: 20885245 DOI: 10.1097/PRS.0b013e3181ee482d]
- 150 **J rholm S**, Johannesson L, Br nnstr m M. Psychological aspects in pre-transplantation assessments of patients prior to entering the first uterus transplantation trial. *Acta Obstet Gynecol Scand* 2015; **94**: 1035-1038 [PMID: 26073658 DOI: 10.1111/aogs.12696]
- 151 **Hu W**, Lu J, Zhang L, Wu W, Nie H, Zhu Y, Deng Z, Zhao Y, Sheng W, Chao Q, Qiu X, Yang J, Bai Y. A preliminary report of penile transplantation. *Eur Urol* 2006; **50**: 851-853 [PMID: 16930814 DOI: 10.1016/j.euro.2006.07.026]
- 152 **Clarke A**, Butler PE. The psychological management of facial transplantation. *Expert Rev Neurother* 2009; **9**: 1087-1100 [PMID: 19589056 DOI: 10.1586/ern.09.42]
- 153 **Nau JY**. Penis transplantation in South Africa. Risk of suicide using varenicline?. *Rev Med Suisse* 2015; **11**: 744-745 [PMID: 26027209]
- 154 **Solez K**. History of the Banff classification of allograft pathology as it approaches its 20th year. *Curr Opin Organ Transplant* 2010; **15**: 49-51 [PMID: 19949334 DOI: 10.1097/MOT.0b013e3182334fedb]
- 155 **Ravindra KV**, Wu S, Bozulic L, Xu H, Breidenbach WC, Ildstad ST. Composite tissue transplantation: a rapidly advancing field. *Transplant Proc* 2008; **40**: 1237-1248 [PMID: 18589081 DOI: 10.1016/j.transproceed.2008.04.003]
- 156 **Tringali R**, Arria A, Trzepacz PT. Psychosocial evaluation and intervention in liver transplantation. *J Appl Biobehav Res* 1994; **2**: 55-64 [DOI: 10.1111/j.1751-9861.1994.tb00038.x]
- 157 **Wilks SE**, Spivey CA, Chisholm-Burns MA. Psychometric re-evaluation of the immunosuppressant therapy adherence scale among solid-organ transplant recipients. *J Eval Clin Pract* 2010; **16**: 64-68 [PMID: 20367816 DOI: 10.1111/j.1365-2753.2008.01115.x]
- 158 **Thompson DA**, Leimig R, Gower G, Winsett RP. Assessment of depressive symptoms during post-transplant follow-up care performed via telehealth. *Telemed J E Health* 2009; **15**: 700-706 [PMID: 19694599 DOI: 10.1089/tmj.2009.0021]

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