Reconstructive Surgery Literature Review

01. Fat Grafting and Adipose-Derived Regenerative Cells in Burn Wound Healing and Scarring: A Systematic Review of the Literature.

Condé-Green A, Marano A, Edward Lee, Reisler T, Price L, Milner S, Granick M. Plastic and Reconstructive Surgery. 137(1):302–312, JAN 2016

PDF: Get PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/26710034

BACKGROUND:

There is an abundance of literature supporting the efficacy of fat grafting in aesthetic and reconstructive cases. There has been a recent emphasis on the regenerative capacity of adipose-derived stem cells and their utility in the improvement of wound healing and scarring provided by their cytokine and growth factor profiles. Despite the wealth of evidence supporting their efficacy, little attention has been paid to their utility in burn treatment. The authors' purpose was to provide an analysis of the literature regarding the use of fat grafting and regenerative cells in the treatment of burn wounds to guide surgeons and scientists on their clinical use.

METHODS:

A systematic review of the literature was performed by a thorough search of 12 terms using the PubMed, Medline, and Cochrane databases. Two hundred forty-one articles were subject to evaluation by predetermined inclusion and exclusion criteria.

RESULTS:

Six murine and 12 human studies were selected, including case-control studies, case series, and case reports. They describe histologic and clinical effects of fat grafting and regenerative cell therapy, including improvements in burn scar size and texture, enhanced angiogenesis, decreased inflammation, alleviation of pain, and return of function.

CONCLUSIONS:

There is a dearth of randomized controlled trials and quantitative analysis supporting the efficacy of fat grafting and adipose regenerative cells in burns. However, the subjective improvements in scars are encouraging. The authors hope that this review will be a foundation for future studies and will highlight the breadth of knowledge yet to be explored by this therapy.

02. Evidence-Based Medicine in Facial Trauma

Doughtery WM, Christophel JJ, Park SS. Facial Plastic Surgery Clinics of North America, 2017-11-01, Volume 25, Issue 4, Pages 629-643

PDF: Get PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/28941514

This article provides the reader with a comprehensive review of high-level evidence-based medicine in facial trauma and highlights areas devoid of high-level evidence. The article is organized in the order one might approach a clinical problem: starting with the workup, followed by treatment considerations, operative decisions, and postoperative treatments. Individual injuries are discussed within each section, with an overview of the available high-level clinical evidence. This article not only provides a quick reference for the facial traumatologist, but also allows the reader to identify areas that lack high-level evidence, perhaps motivating future endeavors.

03. Peripheral nerve regeneration: experimental strategies and future perspectives.

Faroni A, Mobasseri SA, Kingham PJ, Reid AJ. Advanced Drug Delivery Reviews, Volumes 82-83, March 2015, pages 160-167

PDF: Get PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/25446133
Peripheral nerve injuries represent a substantial clinical problem with insufficient or unsatisfactory treatment options. This review summarises all the events occurring after nerve damage at the level of the cell body, the site of injury and the target organ. Various experimental strategies to improve neuronal survival, axonal regeneration and target reinnervation are described including pharmacological approaches and cell-based therapies. Given the complexity of nerve regeneration, further studies are needed to address the biology of nerve injury, to improve the interaction with implantable scaffolds, and to implement cell-based therapies in nerve tissue engineering.

04. Emerging Strategies on Adjuvant Therapies for Nerve Recovery.
Fernandez L, Komatsu DE, Gurevich M, Hurst LC. The Journal of Hand Surgery. Volume 43, Issue 4, April 2018, Pages 368-373.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/29618417
Current strategies for promoting faster and more effective peripheral nerve healing have utilized a wide variety of techniques and approaches. Nerve grafts, conduits, and stem cell therapy all have their respective advantages. However, there are still some difficulties in attaining complete functional recovery with a single treatment modality. The utilization of adjuvant treatments, in combination with current standard-of-care methods, offers the potential to improve patient outcomes. This paper highlights the current landscape of adjuvant treatments for enhancing peripheral nerve repair and regeneration.

05. Current and future options of regeneration methods and reconstructive surgery of the facial skeleton.
Gotz C, Warnke PH, Kolk A. Oral Surg Oral Med Oral Pathol Oral Radiol. 2015 Sep;120(3):315-23.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26297391
Musculoskeletal defects attributable to trauma or infection or as a result of oncologic surgery present a common challenge in reconstructive maxillofacial surgery. The autologous vascularized bone graft still represents the gold standard for salvaging these situations. Preoperative virtual planning offers great potential and provides assistance in reconstructive surgery. Nevertheless, the applicability of autologous bone transfer might be limited within the medically compromised patient or because of the complexity of the defect and the required size of the graft to be harvested. The development of alternative methods are urgently needed in the field of regenerative medicine to enable the regeneration of the original tissue. Since the first demonstration of de novo bone formation by regenerative strategies and the application of bone growth factors some decades ago, further progress has been achieved by tissue engineering, gene transfer, and stem cell application concepts. This review summarizes recent approaches and current developments in regenerative medicine.

06. Peripheral nerve reconstruction after injury--a review of clinical and experimental therapies
Grinsell D, Keating CP. Biomed Res Int. 2014;2014:698256.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/25276813
Unlike other tissues in the body, peripheral nerve regeneration is slow and usually incomplete. Less than half of patients who undergo nerve repair after injury regain good to excellent motor or sensory function and current surgical techniques are similar to those described by Sunderland more than 60 years ago. Our increasing knowledge about nerve physiology and regeneration far outweighs our surgical abilities to reconstruct damaged nerves and successfully regenerate motor and sensory

function. It is technically possible to reconstruct nerves at the fascicular level but not at the level of individual axons. Recent surgical options including nerve transfers demonstrate promise in improving outcomes for proximal nerve injuries and experimental molecular and bioengineering strategies are being developed to overcome biological roadblocks limiting patient recovery.

07. The Surgical Management of Nerve Gaps – Present and Future
Habre BS, et al. Ann Plast Surg. 2018 Mar;80(3):252-261.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/29166306
Peripheral nerve injuries can result in significant morbidity, including motor and/or sensory loss, which can affect significantly the life of the patient. Nowadays, the gold standard for the treatment of nerve section is end-to-end neurorrhaphy. Unfortunately, in some cases, there is segmental loss of the nerve trunk. Nerve mobilization allows primary repair of the sectioned nerve by end-to-end neurorrhaphy if the gap is less than 1 cm. When the nerve gap exceeds 1 cm, autologous nerve grafting is the gold standard of treatment. To overcome the limited availability and the donor site morbidity, other techniques have been used: vascularized nerve grafts, cellular and acellular allografts, nerve conduits, nerve transfers, and end-to-side neurorrhaphy. The purpose of this review is to present an overview of the literature on the applications of these techniques in peripheral nerve repair. Furthermore, preoperative evaluation, timing of repair, and future perspectives are also discussed.

08. Systematic Reviews in Craniofacial Trauma-Strengths and Weaknesses.
Hunter et al., Ann Plast Surg. 2016 Sep;77(3):363-8.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26418794
BACKGROUND:
Despite substantial advances in the management of craniofacial trauma, numerous clinical questions remain. These are increasingly being answered using systematic reviews (SRs). However, caution is warranted as their validity and role in influencing clinical practice has been called into question.
METHODS:
A PubMed search was performed in October 2014 to identify SRs published up to and including September 2014 in 35 scientific journals. Two authors independently reviewed the literature and extracted data from included studies. Discrepancies were resolved by consensus. Assessment of multiple systematic reviews (AMSTAR) was used to determine the quality of SRs.
RESULTS:
The initial search retrieved 3080 articles of which 3051 articles were excluded after screening title and abstract. After full-text review of the remaining 29 articles, 3 additional articles were excluded, thus, leaving 26 SRs for final analysis. Regression analysis demonstrated that the overall number of published SRs increased significantly throughout the period analyzed (P = 0.022). The median AMSTAR score of all SRs was 4.5, consistent with a "poor-to-fair" quality. The interobserver agreement was high, as evidenced by a mean κ of 0.91. Although there appeared to be a trend toward an increase in AMSTAR score by year over the period analyzed, this failed to reach statistical significance in terms of median (P = 0.36) or absolute (P = 0.26) counts.
CONCLUSIONS:
A tremendous opportunity exists for improvements in the quality of SRs focusing on craniofacial trauma. In addition to familiarizing authors with quality criteria for SRs, adoption of strict reporting criteria by scientific journals may result in long-term improvements in the quality of reporting.

09. Advances and Future Applications of Augmented Peripheral Nerve Regeneration

Jones S, Eisenberg HM, Jia X. Int J Mol Sci. 2016 Sep 7;17(9).
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/27618010
Peripheral nerve injuries remain a significant source of long lasting morbidity, disability, and economic costs. Much research continues to be performed in areas related to improving the surgical outcomes of peripheral nerve repair. In this review, the physiology of peripheral nerve regeneration and the multitude of efforts to improve surgical outcomes are discussed. Improvements in tissue engineering that have allowed for the use of synthetic conduits seeded with neurotrophic factors are highlighted. Selected pre-clinical and available clinical data using cell based methods such as Schwann cell, undifferentiated, and differentiated stem cell transplantation to guide and enhance peripheral nerve regeneration are presented. The limitations that still exist in the utility of neurotrophic factors and cell-based therapies are outlined. Strategies that are most promising for translation into the clinical arena are suggested.

10. Immunobiology in VCA
Kaufman et al. Transpl Int. 2016 Jun;29(6):644-54.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26924305
Transplantation of vascularized composite tissue is a relatively new field that is an amalgamation of experience in solid organ transplantation and reconstructive plastic and orthopedic surgery. What is novel about the immunobiology of VCA is the addition of tissues with unique immunologic characteristics such as skin and vascularized bone, and the nature of VCA grafts, with direct exposure to the environment, and external forces of trauma. VCAs are distinguished from solid organ transplants by the requirement of rigorous physical therapy for optimal outcomes and the fact that these procedures are not lifesaving in most cases. In this review, we will discuss the immunobiology of these systems and how the interplay can result in pathology unique to VCA as well as provide potential targets for therapy.

11. State-of-the-Art Techniques in Treating Peripheral Nerve Injury
Kubiak et al. Plast Reconstr Surg. 2018 Mar;141(3):702-710.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/29140901
BACKGROUND:
Peripheral nerve injuries remain a major clinical concern, as they often lead to chronic disability and significant health care expenditures. Despite advancements in microsurgical techniques to enhance nerve repair, biological approaches are needed to augment nerve regeneration and improve functional outcomes after injury.
METHODS:
Presented herein is a review of the current literature on state-of-the-art techniques to enhance functional recovery for patients with nerve injury. Four categories are considered: (1) electroceuticals, (2) nerve guidance conduits, (3) fat grafting, and (4) optogenetics. Significant study results are highlighted, focusing on histologic and functional outcome measures.
RESULTS:
This review documents the current state of the literature. Advancements in neuronal stimulation, tissue engineering, and cell-based therapies demonstrate promise with regard to augmenting nerve regeneration and appropriate rehabilitation.
CONCLUSIONS:
The future of treating peripheral nerve injury will include multimodality use of electroconductive conduits, fat grafting, neuronal stimulation, and optogenetics. Further clinical investigation is needed to

confirm the efficacy of these technologies on peripheral nerve recovery in humans, and how best to implement this treatment for a diverse population of nerve-injured patients.

12. Extracorporeal Perfusion in Vascularized Composite Allotransplantation- Current Concepts and Future Prospects

Kueckelhaus et al. Ann Plast Surg. 2018 Jun;80(6):669-678.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/29746324

Severe injuries of the face and limbs remain a major challenge in today's reconstructive surgery. Vascularized composite allotransplantation (VCA) has emerged as a promising approach to restore these defects. Yet, there are major obstacles preventing VCA from broad clinical application. Two key restrictions are (1) the graft's limited possible ischemia time, keeping the potential donor radius extremely small, and (2) the graft's immunogenicity, making extensive lifelong monitoring and immunosuppressive treatment mandatory. Machine perfusion systems have demonstrated clinical success addressing these issues in solid organ transplantation by extending possible ischemia times and decreasing immunogenicity. Despite many recent promising preclinical trials, machine perfusion has not yet been utilized in clinical VCA. This review presents latest perfusion strategies in clinical solid organ transplantation and experimental VCA in light of the specific requirements by the vascularized composite allograft's unique tissue composition. It discusses optimal settings for temperature, oxygenation, and flow types, as well as perfusion solutions and the most promising additives. Moreover, it highlights the implications for the utility of VCA as therapeutic measure in plastic surgery, if machine perfusion can be successfully introduced in a clinical setting.

13. Hand Trauma Care in the United States: A Literature Review.

Maroukis et al. Plast Reconstr Surg. 2016 Jan;137(1):100e-111e.
PDF: GET PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26368327

BACKGROUND:
Hand trauma is one of the most complex injuries treated in the emergency department. Hand trauma injuries are time sensitive and require highly specialized care. Patients may have difficulty accessing appropriate hand trauma care because of a variety of factors. The authors aimed to evaluate the state of the hand trauma system by examining articles that reported on access to hand trauma care.
METHODS:
The authors conducted a literature review on hand trauma care using the PubMed, Ovid MEDLINE, and Embase databases. The authors included English language articles from the United States that described access to hand trauma care in the emergency health system.
RESULTS:
Fourteen studies met the authors' inclusion criteria. Ten studies evaluated access to hand trauma care on a patient level. Of these 10 studies, five reported on access to care for transferred patients and five reported on access to care for patients with amputation injuries. The other four studies evaluated access to hand trauma care at a hospital level.
CONCLUSIONS:
Lack of hand trauma guidelines at emergency departments and a severe shortage of on-call hand specialists at community hospitals and trauma centers have created a suboptimal system of hand emergency care in the United States. The current system of hand trauma care in the United States not only may drive up the cost of care but may also adversely affect patients' health and well-being.

14. Regenerative Medicine in Lower Limb Reconstruction
McEwan et al. Regen Med. 2018 Jun;13(4):477-490.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/29985779
Bone is a highly specialized connective tissue and has a rare quality as one of the few tissues that can repair without a scar to regain pre-injury structure and function. Despite the excellent healing capacity of bone, tumor, infection, trauma and surgery can lead to significant bone loss requiring skeletal augmentation. Bone loss in the lower limb poses a complex clinical problem, requiring reconstructive techniques to restore form and function. In the past, amputation may have been the only option; however, there is now an array of reconstructive possibilities and cellular therapies available to salvage a limb. In this review, we will evaluate current applications of bone tissue engineering techniques in limb reconstruction and identify potential strategies for future work.

15. Surgery for nerve injury: current and future perspectives.
Midha R, Grochmal J. J Neurosurg. 2019 Mar 1;130(3):675-685.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30835708
In this review article, the authors offer their perspective on nerve surgery for nerve injury, with a focus on recent evolution of management and the current surgical management. The authors provide a brief historical perspective to lay the foundations of the modern understanding of clinical nerve injury and its evolving management, especially over the last century. The shift from evaluation of the nerve injury using macroscopic techniques of exploration and external neurolysis to microscopic interrogation, interfascicular dissection, and internal neurolysis along with the use of intraoperative electrophysiology were important advances of the past 50 years. By the late 20th century, the advent and popularization of interfascicular nerve grafting techniques heralded a major advance in nerve reconstruction and allowed good outcomes to be achieved in a large percentage of nerve injury repair cases. In the past 2 decades, there has been a paradigm shift in surgical nerve repair, wherein surgeons are not only directing the repair at the injury zone, but also are deliberately performing distal-targeted nerve transfers as a preferred alternative in an attempt to restore function. The peripheral rewiring approach allows the surgeon to convert a very proximal injury with long regeneration distances and (often) uncertain outcomes to a distal injury and repair with a greater potential of regenerative success and functional recovery. Nerve transfers, originally performed as a salvage procedure for severe brachial plexus avulsion injuries, are now routinely done for various less severe brachial plexus injuries and many other proximal nerve injuries, with reliably good to even excellent results. The outcomes from nerve transfers for select clinical nerve injury are emphasized in this review. Extension of the rewiring paradigm with nerve transfers for CNS lesions such as spinal cord injury and stroke are showing great potential and promise. Cortical reeducation is required for success, and an emerging field of rehabilitation and restorative neurosciences is evident, which couples a nerve transfer procedure to robotically controlled limbs and mind-machine interfacing. The future for peripheral nerve repair has never been more exciting.

16. Past, Present, and Future of Nerve Conduits in the Treatment of Peripheral Nerve Injury
Muheremu A, Ao Q. Biomed Res Int. 2015;2015:237507
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26491662
With significant advances in the research and application of nerve conduits, they have been used to repair peripheral nerve injury for several decades. Nerve conduits range from biological tubes to

synthetic tubes, and from nondegradable tubes to biodegradable tubes. Researchers have explored hollow tubes, tubes filled with scaffolds containing neurotrophic factors, and those seeded with Schwann cells or stem cells. The therapeutic effect of nerve conduits is improving with increasing choice of conduit material, new construction of conduits, and the inclusion of neurotrophic factors and support cells in the conduits. Improvements in functional outcomes are expected when these are optimized for use in clinical practice.

17. Advances in the Neurological and Neurosurgical Management of Peripheral Nerve Trauma
Simon NG, Spinner RJ, Kline DG, Kliot M. J Neurol Neurosurg Psychiatry. 2016 Feb;87(2):198-208.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/25922080
Peripheral nerve trauma frequently affects younger people and may result in significant and long-lasting functional disability. Currently, diagnosis and monitoring of peripheral nerve injury relies on clinical and electrodiagnostic information, supplemented by intraoperative electrophysiological studies. However, in a significant proportion of nerve injuries, the likelihood of spontaneous regeneration resulting in good functional outcome remains uncertain and unnecessary delays to treatment may be faced while monitoring for recovery. Advances in non-invasive imaging techniques to diagnose and monitor nerve injury and regeneration are being developed and have the potential to streamline the decision-making process. In addition, advances in operative and non-operative treatment strategies may provide more effective ways to maximise functional outcomes following severe peripheral nerve trauma. This review discusses these advances in light of the current state of the art of management of peripheral nerve trauma.

18. Open Fractures of the Hand - Review of Pathogenesis and Introduction of a New Classification System
Tulipan JE, Ilyas Am. Hand Clin. 2018 Feb;34(1):1-7.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/29169590
Open fractures of the hand are a common and varied group of injuries. Although at increased risk for infection, open fractures of the hand are more resistant to infection than other open fractures. Numerous unique factors in the hand may play a role in the altered risk of postinjury infection. Current systems for the classification of open fractures fail to address the unique qualities of the hand. This article proposes a novel classification system for open fractures of the hand, taking into account the factors unique to the hand that affect its risk for developing infection after an open fracture.

19. Management of Soft Tissue Defects of the Hand
Yannascoli SM, Thibaudeau S, Levin LS. J Hand Surg Am. 2015 Jun;40(6):1237-44
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/25936734
Soft tissue coverage of the hand remains a challenging problem to the hand surgeon, but advances in the field of microsurgery have provided improved thin, pliable, durable flaps that offer cosmetic reconstructive options. The reconstructive elevator is poised to replace the reconstructive ladder, thereby allowing early reconstruction by the best available option. This review focuses on the variety of pedicled, free fasciocutaneous, and venous flaps available for successful soft tissue coverage of the hand.

20. Evidence-based medicine in hand surgery- clinical applications and future direction

Zafonte B, Szabo RM. Hand Clin. 2014 Aug;30(3):269-83, v.
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/25066846
Evidence-based medicine empowers physicians to systematically analyze published data so as to quickly formulate treatment plans that deliver safe, robust, and cost-effective patient care. In this article, we sample some areas in hand and upper extremity surgery where the evidence base is strong enough that it has or should have unified treatment strategies; we identify some problems where good evidence has failed to unify treatment, and discuss problems for which evidence is still lacking but needed because treatment remains controversial. We also discuss circumstances in which level 4 evidence is more likely than randomized trials to guide treatment.

21. The effects of stem cells on burn wounds: a review.
Francis E, Kearney L, Clover J. Int J Burns Trauma. 2019 Feb 15;9(1):1-12
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30911430
INTRODUCTION:
Stem cell therapy application is at the vanguard of regenerative medicine across all medical disciplines. Stem cells are of special interest in burn wounds, as they have multiple potential indications for application; including - accelerating wound healing, improving skin regeneration to incorporate skin appendages, reducing fibrosis and improving scarring.
METHODS:
A literature review was performed using both MeSH and keyword searches of PubMed to identify all potentially suitable publications. Search criteria were restricted to the English language, but acceptable English translations were sought for inclusion. Inclusion dates were from 2003 up until and including 2017. Studies included looked at stem cells in burn wounds only.
RESULTS:
There were 692 potentially suitable publications of which 72 were included for review. These included a systematic reviews and original research articles.
CONCLUSIONS:
Stem cells accelerate burn wound healing by inducing neo-angiogenesis, collagen deposition and granulation tissue formation. They modulate the inflammatory response and reduce the risk of infection. They can regenerate skin appendages and halt he zone of stasis in acute burn injury. However with these pre-clinical animal model studies we must be cautious with our interpretation of this novel therapy.

22. More Than Just a Bandage: Closing the Gap Between Injury and Appendage Regeneration.
Kakebeen AD, Wills AE. Front Physiol. 2019 Feb 8;10:81
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30800076
The remarkable regenerative capabilities of amphibians have captured the attention of biologists for centuries. The frogs *Xenopus laevis* and *Xenopus tropicalis* undergo temporally restricted regenerative healing of appendage amputations and spinal cord truncations, injuries that are both devastating and relatively common in human patients. Rapidly expanding technological innovations have led to a resurgence of interest in defining the factors that enable regenerative healing, and in coupling these factors to human therapeutic interventions. It is well-established that early embryonic signaling pathways are critical for growth and patterning of new tissue during regeneration. A growing body of research now indicates that early physiological injury responses are also required to initiate a regenerative program, and that these differ in regenerative and non-regenerative contexts. Here

we review recent insights into the biophysical, biochemical, and epigenetic processes that underlie regenerative healing in amphibians, focusing particularly on tail and limb regeneration in *Xenopus*. We also discuss the more elusive potential mechanisms that link wounding to tissue growth and patterning.

23. The Use of Stem Cells in Neural Regeneration: A Review of Current Opinion.
Wang Y, Pan J, Wang D, Liu J. Curr Stem Cell Res Ther. 2018;13(7):608-617
PDF: No PDF available
URL: https://www.ncbi.nlm.nih.gov/pubmed/30027853
Nerve injury is a large problem that produces much pain in patients. Injury to the nervous system causes serious consequences and affects a person's quality of life. The development of tissue engineering has created a brighter future for nerve regeneration, and research has not stopped since the discovery of stem cells. Stem cells are a type of pluripotent cell that exhibits the capacity of self differentiation and proliferation. Many studies have demonstrated the ability of stem cells to differentiate into other types of cells, including neurons, after induction with trophic factors in vivo and in vitro. Scientists have isolated a variety of stem cells from different organs and tissues in the human body and demonstrated that these cells were efficacious in regenerative medicine. The use of these cells provides a non-surgical method for the treatment of neurological diseases, such as nerve defects. However, many problems must be resolved before using these cells in the clinical field. The microenvironment and delivery methods of cells also affect the regeneration process. The present article comprehensively summarizes the progress of stem cells in the field of nerve regeneration in the recent decades.

24. Regenerative Medicine Applications in Wound Care.
Nilforoushzadeh MA, et al. Curr Stem Cell Res Ther. 2017;12(8):658-674
PDF: NO PDF available
URL: https://www.ncbi.nlm.nih.gov/pubmed/28969578
BACKGROUND:
During the last two decades, a number of studies have been carried out on the application of regenerative medicine in the field of dermatology.
OBJECTIVE:
The aim of this research was to critically review the application of regenerative medicine in the field of dermatology. The next aim was to look in depth to see whether regenerative medicine strategies have a place in the future of wound healing in a clinical setting. More specifically, to see if these strategies would apply for burns and non-healing diabetic wounds.
RESULTS:
Billions of dollars have been spent worldwide on research in wound treatment and skin regeneration. Although a high number of clinical trials show promising results, there is still no commercially available treatment for use. In addition, the outcome data from the clinical trials, taking place throughout the world, are not published in a standardized manner. Standardization within clinical trials is required for: protocols, outcome, endpoint values, and length of follow-up. The lack of standardization makes it much more difficult to compare the data collected and the different types of treatment.
CONCLUSION:
Despite several promising results from research and early phase clinical studies, the treatment for wounds as well as skin regeneration is still considered as an unmet clinical need. However, in the past three years, more promising research has been approaching clinical trials; this could be the solution that clinicians have been waiting for. This is a multibillion dollar industry for which there should be enough incentive for researchers and industry to seek the solution.

25. Trends in tissue repair and regeneration.
Galliot B, et al. Development. 2017 Feb 1;144(3):357-364
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/28143842
The 6th EMBO conference on the Molecular and Cellular Basis of Regeneration and Tissue Repair took place in Paestum (Italy) on the 17th-21st September, 2016. The 160 scientists who attended discussed the importance of cellular and tissue plasticity, biophysical aspects of regeneration, the diverse roles of injury-induced immune responses, strategies to reactivate regeneration in mammals, links between regeneration and ageing, and the impact of non-mammalian models on regenerative medicine.

26. Regenerative medicine applications in combat casualty care.
Fleming ME, Bharmal H, Valerio I. Regen Med. 2014 Mar;9(2):179-90
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/24750059
The purpose of this report is to describe regenerative medicine applications in the management of complex injuries sustained by service members injured in support of the wars in Afghanistan and Iraq. Improvements in body armor, resuscitative techniques and faster transport have translated into increased patient survivability and more complex wounds. Combat-related blast injuries have resulted in multiple extremity injuries, significant tissue loss and amputations. Due to the limited availability and morbidity associated with autologous tissue donor sites, the introduction of regenerative medicine has been critical in managing war extremity injuries with composite massive tissue loss. Through case reports and clinical images, this report reviews the application of regenerative medicine modalities employed to manage combat-related injuries. It illustrates that the novel use of hybrid reconstructions combining traditional and regenerative medicine approaches are an effective tool in managing wounds. Lessons learned can be adapted to civilian care.

27. Stem cell applications in military medicine.
Christopherson GT, Nesti LJ. Stem Cell Res Ther. 2011 Oct 19;2(5):40
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/22011454
There are many similarities between health issues affecting military and civilian patient populations, with the exception of the relatively small but vital segment of active soldiers who experience high-energy blast injuries during combat. A rising incidence of major injuries from explosive devices in recent campaigns has further complicated treatment and recovery, highlighting the need for tissue regenerative options and intensifying interest in the possible role of stem cells for military medicine. In this review we outline the array of tissue-specific injuries typically seen in modern combat - as well as address a few complications unique to soldiers--and discuss the state of current stem cell research in addressing each area. Embryonic, induced-pluripotent and adult stem cell sources are defined, along with advantages and disadvantages unique to each cell type. More detailed stem cell sources are described in the context of each tissue of interest, including neural, cardiopulmonary, musculoskeletal and sensory tissues, with brief discussion of their potential role in regenerative medicine moving forward. Additional commentary is given to military stem cell applications aside from regenerative medicine, such as blood pharming, immunomodulation and drug screening, with an overview of stem cell banking and the unique opportunity provided by the military and civilian overlap of stem cell research.

28. Facial transplantation. An update of results and perspectives from tissue engineering.
Simonacci F, Toni R, Raposio E. Ann Ital Chir. 2017;88:352-359

PDF: No PDF available
URL: https://www.ncbi.nlm.nih.gov/pubmed/29051396
BACKGROUND/AIM:
Facial transplantation is a revolutionary procedure developed recently, which is indicated if autologous transfers fail to restore human appearance. More than 30 patients have undergone facial transplantation in different centers worldwide. Here, we provide an update on its main anatomical, surgical, immunological, ethical, and follow- up aspects. We also provide innovative perspectives of regenerative medicine and tissue engineering that could hold promise for this emerging surgical field.
METHODS:
Through careful review of the anatomical, surgical, and tissue-engineering literature, we documented the main aspects of this innovative surgical procedure and its potential improvements in regenerative plastic surgery.
RESULTS:
Compatibility for the major blood groups (ABO) and human leukocyte antigen system between donor and recipient is critical to transplantation success. Major complications are tissue rejection and side effects of immunosuppression. The functional outcomes of facial transplantation are encouraging, with slow recovery of motor and sensory functions. Psychological impact on the family of the donor and recipient is essential for the success of facial transplantation.
CONCLUSIONS:
Uncertainty of long-term outcomes, immunosuppression-related concerns and ethical debates limit worldwide application of facial allotransplantation. However, in selected patients it is a unique reconstruction method with promising outcomes. Recent developments in regenerative medicine open a new frontier for application of patient-tailored, biocompatible and engineered reproductions of the various anatomical components of the face, and their application to transplant technology. Further research in transplant immunology, survival and conservation of grafts, and regenerative treatments of lesioned and/or transplanted tissues hold the key to advances in this emerging surgical option.

29. What is the future of 'organ transplantation' in the head and neck?
Lott DG. Curr Opin Otolaryngol Head Neck Surg. 2014 Oct;22(5):429-35
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/25101936
PURPOSE OF REVIEW:
To update readers on the current state and future of head and neck tissue transplantation.
RECENT FINDINGS:
Many exciting advances have recently occurred in the field of head and neck transplantation and regenerative medicine. Larynx, face, and trachea transplants have all been successfully performed. Significant advancements in tissue engineering have occurred, including the ability to generate three-dimensional tissue structures. Transplantation of regenerated tissues has been successfully incorporated into airway reconstruction.
SUMMARY:
These exciting advancements set the foundation to expand reconstructive options for dysfunctional tissues and to improve a patient's quality of life.

30. Face Transplantation: An Update for the United States Trauma System.
Farber SJ, et al. J Craniofac Surg. 2018 Jun;29(4):832-838
PDF: Get PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/29771838

Face transplantation has evolved over the last 12 years into a safe and feasible reconstructive solution, with good aesthetic and functional outcomes for patients with severe facial defects who are not amenable to reconstruction through conventional and autologous approaches. Among patients who underwent face transplantation to date, a significant proportion did so following trauma, mostly ballistic and thermal injuries. It is therefore important for trauma surgeons who deal with these injuries regularly to be familiar with the literature on face transplantation following traumatic injuries. In this study, we provide a focused review on this topic, with an emphasis on highlighting the limitations of conventional craniomaxillofacial reconstruction, while emphasizing data available on the risks, benefits, surgical indications, contraindications, as well as aesthetic and functional outcomes of face transplantation. The authors also provide an update on all face transplants performed to date including traumatic mechanisms of injury, and extent of defects. They finally describe 2 cases performed by the senior author for patients presenting with devastating facial ballistic and thermal injuries. The authors hope that this work serves as an update for the trauma surgery community regarding the current role and limitations of face transplantation as a craniomaxillofacial reconstructive option for their patient population. This can potentially expedite the reconstructive process for patients who may benefit from face transplantation.