4th international
scar-club
meeting

program

From Wounds to Scars:
Amplifying therapeutic resources

Faculty of Medicine, Montpellier, France
22–24 March 2012

Supported by
Scientific program

Thursday March 22

8:00 a.m. - 8:15 a.m.  Introduction
Olivier Dereure (Montpellier)

8:15 a.m. - 8:30 a.m.  Opening the 4th Scar Meeting
Luc Téot (Montpellier)

8:30 a.m. - 10:00 a.m.  The most current strategies for scar management
Ken Dolynchuk (Miami), Ed Tredget (Calgary), Wei Liu (Shanghai), Claude Roques (Lamalou) / Moderators W. Liu, C. Roques

10:00 a.m. - 10:30 a.m.  Coffee break

10:30 a.m. - 11:00 a.m.  Antis-scarring therapies for corneal and conjunctival injuries
Greg Schultz (Florida)

11:00 a.m. - 12:00 a.m.  Barb sutures
Luc Téot (Montpellier), Georg Huemer (Vienna), Uberto Giovannini (Metz) / Moderator G. Huemer

12:00 a.m. - 12:30 a.m.  Classification and evaluation of keloids and hypertrophic scars
A trial of Japan scar workshop
Rei Ogawa (Tokyo)

12:30 a.m. - 2:00 p.m.  Lunch
Visit of the museum of anatomy

2:00 p.m. - 3:30 p.m.  New scar management practical guidelines
Luc Téot (Montpellier), Stanislas Monstrey (Gent), Franco Bassetto (Padova) / Moderator L. Téot

3:30 p.m. - 4:00 p.m.  Coffee break

4:00 p.m. - 6:00 p.m.  Oral presentations – Clinical case report / Moderator G. Gurtner
- Use of alveolate pressure splints for the treatment of scary surfaces and cheloids, Fabienne Braye
- Can single use negative pressure wound therapy be an alternative method to manage keloid scarring? A preliminary report of a clinical and ultrasound/color-power-doppler study, Marco Fraccalvieri
- Surgical Treatment of Depressed Scar with Integra single layer template matrix (ISL), Uberto Giovannini
- Scar Biology - Post-surgical scar activity - Fact or fiction, Anil Kumar Luniya
- Microneedling on mature burn scars: a case series report, Peter Moortgat

6:00 p.m. - 7:00 p.m.  Mechanostimulation of scarring
Alexis Desmoulière (Limoges), Geoffrey Gurtner (San Francisco), Lars Steinstrasser (Bochum), Rei Ogawa (Tokyo) / Moderator L. Steinstrasser

7:00 p.m. - 8:00 p.m.  Cocktail in the faculty of medicine
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Presenter(s)</th>
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<tbody>
<tr>
<td>8:00 a.m. - 9:00 a.m.</td>
<td>After scarring problems (skin radiation, recurrences of wounds, stabilization of skin fissures and hyperkeratosis)</td>
<td>Esther Middlekoop (Amsterdam), Sylvie Meaume (Paris), Anne Le Pillouer-Prost (Marseille) / Moderator S. Meaume</td>
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<td>9:00 a.m. - 9:30 a.m.</td>
<td>Moisture and silicon</td>
<td>Tom Mustoe (Chicago)</td>
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<td>9:30 a.m. - 10:30 a.m.</td>
<td>Symposium laser</td>
<td>Anne Le Pillouer-Prost (Marseille) and two international experts / Moderator A. Le Pillouer-Prost</td>
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<td>10:30 a.m. - 10:45 a.m.</td>
<td>Coffee break</td>
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<td>10:45 a.m. - 11:45 a.m.</td>
<td>Scar management using topical agents</td>
<td>Luc Téot (Montpellier), Ed Tredget (Calgary), Wei Liu (Shanghai) / Moderator E. Tredget</td>
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| 11:45 a.m. - 1:15 p.m. | Oral presentations – Clinical trials / Moderators E. Middlekoop, Mr Ogawa                  | • The relationship between skin stretching / contraction and pathological scarring, Yuki Nagashima, using topical Cryo-anaesthesia, Zhen Gao  
• The effects of Prus* Depressomassage on pain, pruritus and sensory perception in burn scars, Jill Meirte  
• 3D digital stereophotogrammetry: a reliable and valid technique for measuring scar surface area, Carlyn Stekelenburg   
• On skin and scar pigmentation, Martyn Van Der Wal |
| 1:15 p.m. - 2:30 p.m. | Lunch                                                                                      |                                                                              |
| 2:30 p.m. - 4:00 p.m. | Defining « Medically necessary for scar revision »                                         | Ken Dolynchuk (Miami), Rei Ogawa (Tokyo), Paul Van Zuiljen (Amsterdam) / Moderator P. Van Zuijlen |
| 4:00 p.m. - 5:00 p.m. | Mesenchymal stem cells and scarring regenerative effects                                   | Franco Bassetto (Padova), Bernard Coulomb (Paris), Alexis Desmoulière (Limoges) / Moderator A. Desmoulière |
| 5:00 p.m. - 7:00 p.m. | Oral presentations – Research / Moderators T. Mustoe, G. Schultz                           | • Topical application of olive oil accelerates wound healing, Marcela Otronto  
• Mechanical performance of 2-octylcyanoacrylate tissue adhesive, Lukas Capek  
• Angiotensin II is a Target to Prevent Burn Scar Contracture Independent of Myofibroblasts, Howard Levinson  
• Abnormal terminal differentiation and increases thickness of the epidermis in keloid scars, Grace Limandjaja   
• Knocking out smad-3 constitutes a microenvironment favored for the development of transplanted fetal skin, Ke Liu  
• The potential use of platelet rich plasma in the treatment of burns, Rose Marck |
| 8:30 p.m. | Official reception                                                                         | Holiday Inn Metropole Hotel (on registration)                                |
Saturday March 24

8:00 a.m. - 9:30 a.m.  Management of hypertrophic scars
Claude Roques (Lamalou), Geoffrey Gurtner (San Francisco), Rei Ogawa (Tokyo) / Moderators G. Gurtner, R. Ogawa
(With the presence of patients asking for solutions)
Surgery, Physiotherapy, Chemotherapy, Lasers, Cryotherapy

9:30 a.m. - 9:45 a.m.  Coffee break

9:45 a.m. - 11:15 a.m.  Management of keloids
Wei Liu (Shanghai), Luc Téot (Montpellier) / Moderator W. Liu
(With the presence of patients asking for solutions)
Surgery, Physiotherapy, Chemotherapy, Lasers, Others

11:15 a.m. - 12:15 a.m.  Oral presentations / Moderator K. Dolynchuk
• Enhanced expression of membrane transporter and drug resistance in keloid fibroblasts, Nan Song
• Establishment of a keloid model by transplanting human keloid onto the backs of nude mice, Cécile Philandrianos

12:15 a.m.  Closure of the meeting
Avec UrgoTul, redonnez-leur le sourire!

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Notice consultable sur : www.urgotul.fr
Lectures’ summaries

BASSETTO Franco
COULOMB Bernard
DESMOULIERE Alexis
LE PILLOUER PROST Anne
LIU Wei
MIDDLEKOOP Esther
MUSTOE Thomas
OGAWA Rei
ROQUES Claude
SCHULTZ Gregory
STEINSTRASSER Lars
TEOT Luc
TREDEGET Ed
VAN ZUIJLEN Paul

Symposium Medapharma
BASSETTO Franco  

MESENCHYMAL STEM CELLS AND SCARRING  

Adipose tissue is a point of most interest in medical sciences for the remarkable opportunities it seems to offer in reconstructive surgery and regenerative medicine. A wide range of therapeutic challenges and opportunities are currently investigated in the clinical setting. In particular, the regenerative/reconstructive effectiveness of adipose tissue grafting has been investigated by our Research Group in the treatment of oncologic breast surgery sequelae, congenital malformations, pathologic scars, burn sequelae, radiodermatitis and radiation ulcers, pressure sores, wound healing, localized scleroderma, acne pits. Similarly, the same investigations have been performed in aesthetic medicine and surgery, including breast surgery and facial rejuvenation, and in hand surgery for the treatment of Dupuytren disease. We propose and discuss our clinical experience.

COULOMB Bernard  

GINGIVAL FIBROBLASTS: A CELL THERAPY STRATEGY FOR TISSUE REPAIR  

Tissue repair is a priority need of any living tissue or organ for recovering functional properties after injury. The repair process is a complex phenomenon that involves soluble mediators, blood cells, components of the extracellular matrix, especially the cells from the tissue itself such as fibroblasts. Basically, healing combines three successive phases: inflammation, granulation tissue formation, and remodeling. The quality of the healing, including disappearance of the lesions and the recovery of functional characteristics of the damaged tissue, results from a delicate balance of these three processes. The remodeling phase, in which fibroblasts play a major role, is crucial to restore the original tissue and its functions.

In contrast to embryo of several animal species in which the healing of wounds is perfect without any sequels, the wound healing in adults is nearly always associated to consequences (scar) that may lead to functional defects (hypertrophic scar for example after burn lesions). But in fact, depending on the tissue, the efficiency of healing is unequal and one can observe that gingival healing in adult can be considered as embryo-like. This is due to the fascinating ability of gingival fibroblasts to restore ad integrum the tissue without scar formation and fibrosis.

We thus aimed to validate the concept of using gingival fibroblast healing properties in another tissue. The proof of this concept was obtained in the context of arterial remodeling, both in vitro and in vivo.
The presence of gingival fibroblasts co-cultured with rabbit aortic segments within collagen gels prevents elastic network fragmentation. This is associated with a significant reduction of MMP-9 (elastase) activity, due to an induction of TIMP-1 secretion leading to an increase of MMP-9/TIMP-1 complexes formation.

The efficiency of gingival fibroblasts is confirmed in vivo in an experimental aneurysm model induced in rabbit carotid artery by elastase incubation. Gingival fibroblasts cell therapy reduces the size of these experimental aneurisms and restore the elastic network. In parallel, as observed in vitro, MMP-9 activity is decreased and TIMP-1 secretion increased. Gingival fibroblasts persist at least three months within the arterial wall and are able to proliferate.

None of these effects observed with gingival fibroblasts are obtained with dermal fibroblasts, illustrating the specific efficiency of gingival fibroblasts in tissue repair. Vascular transfer of gingival fibroblasts is thus a promising approach to treat aortic aneurysms and more particularly abdominal aortic aneurisms (AAA) for which the current surgical treatments do not treat the pathophysiology.

DESMOULIERE Alexis

MECHANOOSTIMULATION OF SCARRING
MYOFIBROBLAST BIOLOGY

Normal tissue repair includes a number of overlapping phases. After injury, there is an early inflammatory step characterized by hemorrhage and clotting. In the next phase allowing the development of the granulation tissue, fibroblasts invade the wound and commence replacing the provisional matrix with a more mature wound matrix. As the granulation tissue phase proceeds, fibroblasts start showing a new phenotype with prominent microfilament bundles. These typical myofibroblasts have been shown to develop a smooth muscle phenotype, and are responsible for wound contraction. Lastly, in the resolution phase of healing, there is considerable loss of various cell types including myofibroblasts, by apoptosis. The signal for this cell death is unknown but may be related to reductions in the concentrations of local trophic factors or to modifications in myofibroblast adhesion to the extracellular matrix. Inappropriate delay of apoptosis, and thus increased survival of myofibroblasts activated during the healing process, may be a factor which leads to pathological situations and excessive scarring. The aim of this presentation is to describe the mechanisms of myofibroblast evolution during normal and pathological situations and to discuss their interactions with the extracellular matrix. Indeed, the transient acquisition of the myofibroblast phenotype is beneficial for normal tissue repair processes but persistence of myofibroblasts results in tissue stiffening and deformation.
LE PILLOUER PROST Anne

WHAT’S NEW IN LASERS AND SCARS?

Wound healing remains a complex and unpredictable process and can go wrong: excessive with fibroblast (FB) proliferation, resulting in hypertrophic or keloidal scars, or conversely insufficient resulting in atrophic scars. A lot of cells, inflammatory or mechanobiological mediators, cytokines, growth factors, enzymes and their inhibitors, cell-to-cell and cell-to-cytokine signals are implied, imbricated and not yet fully understood. Since 1983, (works of Castro and coll) lasers have demonstrated clinically, histologically and immuno-histochemically their capacity of “photobiomodulation” to switch hypertrophic or keloidal FB phenotype to “normal” FB phenotype expression, or to stimulate fibroblast proliferation and synthesis. Moreover, we have recently begun dreaming and hoping to induce tissue regeneration closer to foetal scarless wound healing by lasers and lights. In the recent years, main publications and advanced researches have been mainly for:

- Hypertrophic and keloidal scars (never let us forget: biopsy if needed for differential diagnosis and combined management for optimal results: occlusion/compression, intralesional steroids…)

“Off-subject …”: microporous paper tape and silicone gel sheeting demonstrated equal effectiveness...(Arch Facial Plast Surg 2011 Aug) !!!

- Recent Meta-Analysis: “Scientific Evidence” only for Pulsed Dye Laser (PDL) 585 nm, 595 nm and “no scientific proof” for Intense Pulsed Light (IPL), Non Ablative Fractional Laser (NAFL) 1550 nm, CO₂ Ablative Fractional Laser (AFL), 532 nm laser, 2940 nm Erbium laser (no sufficient series reported). But since the publication of this meta-analysis, other series were conducted for PDL 595 nm, NAFL and AFL

- Pulsed Dye Laser (PDL) has confirmed its efficiency (combined with occlusion/compression, IL corticosteroids…): low energy, short pulse duration are always recommended (0.5 ms-2 ms; 4.5-7 J/cm²)

- Non Ablative Fractional Laser (NAFL) 1550 nm: many positive series have been reported until 2010, but since then, we have noticed a lack of reported results with no superiority versus PDL, or inefficiency for a 1320/1440 nm device

- CO₂ Ablative Fractional Laser (AFL) : Numerous series or clinical cases are reported with great efficiency and a trend to non inferiority versus PDL Other Lasers or energy based devices
  - Nd:YAG Long Pulse 1064 nm
  - Q-switch Nd:YAG
  - LEDs (Light Emitting Diodes) and PDT (photodynamic therapy)
- For atrophic postacne scarring (APS): let us never forget surgery, if needed, punch incision technique, and the well-known efficacy of traditional ablative laser resurfacing.

- NAFL, AFL or combined NAFL + AFL with exciting results on the face, and, moreover, for extra facial areas like chest or back

- For the prevention or scar minimization –post-surgical or traumatic (never let us forget respect of tension lines, use of botulinum toxin for decreasing facial movement and stress, no inflammation, no fragment...)
  - In the operative room during the day of surgery: diode laser EKKYO 810 nm and new wavelengths (1210 or 1320 nm)
  - PDL : the day of suture removal with demonstrative results in short series reported
  - 532 nm laser
  - NAFL, AFL

- For hypochromic scars: they are very difficult cases to improve and excimer lasers or lamps are rarely available in medical offices. Recent literature highlighted the possibilities of AFL again and we report in this journal a representative case... Exact mechanism of efficiency still remain unknown, but induction of differentiation and migration of “niched” pilo-sebaceous melanoblasts seems possible by these fractional ablative technology: rule of cytokines? Inflammation ? Thermal effect?

Ccl : Wound healing processes are very complex due to the existence of a lot of abnormal scars types and considerable variation between individuals. Although many case reports, series and studies on scar improvement by laser technology have been published over the last 20 years, there is a great deal of difficulty for comparing these studies, and the choice of the “better” device for each type of scar remains challenging in 2012. Further studies will be needed to identify each laser device and assess its own possibilities, optimal settings, parameters and treatment schedules.

Key Words: laser, scar, hypertrophic, atrophic, hypochromic

**LIU Wei**

**APPLICATION OF MICROPLASMA IN REMODELING OR PREVENTING INCISIONAL SCARRING: A REPORT OF PRELIMINARY TRIAL**

Xiaoli Wu, Zhen Gao, Wei Liu

Incisional scar resulting from injury or surgical incision is commonly seen clinically. Although scar prevention is an approach being proposed and tested, it remains difficult to achieve satisfactory therapeutic results. We proposed adopting a tissue remodeling strategy to treat
existing incisional scarring using microplasm technique with a mode of fractional thermal effect. About 50 patients were involved in the study. Patients with existing incisional scar were treated with microplasma with an interval of 6-8 weeks. The results showed that scar appearance was apparently improved as the scar become flattening and vague after 3-4 treatments when compared to non-treated scar, and much better improvement could be observed with more treatments. We then further tested the remodeling of early scar at 4-6 weeks post-surgery. The results showed that much better therapeutic effect could be achieved by microplasma when compare to an old incisional scar, indicating that the remodeling is much easier for an early formed scar than an old scar with dense fibrotic tissue structure. Furthermore, preliminary trial of treating an early wound at 1-2 post wounding could largely prevent the formation of an incisional scar in part of treated patients when observed grossly. These results of preliminary trials suggest that scar remodeling might be an adoptable strategy for incisional scar therapy.

COMBINATIONAL USE OF 5-FU AND OTHER THERAPIES FOR KELOID TREATMENT

Xiaoli Wu, Zhen Gao, Wei Liu

Keloid is a disease difficult to treat due to its high recurrence. Our group has applied 5-FU based chemotherapy for keloid treatment in large number of patients with many years follow-up. In addition to injection with steroid, combinational use with surgical therapy and laser therapy was also applied. Our experience indicates that keloid is a curable disease and possible to control its relapse when longer enough 5-FU based therapy can be applied, given that the side effect of chemotherapy is able to be controlled and minimized. Combinational use of other therapies can also minimize the drug dose and enhance therapeutic efficiency. This talk will introduce our experience of this therapeutic approach.

MEAUME Sylvie

AFTER SCARRING PROBLEMS

Scars, after an initial period of clinical evolution, varying in time from 3 months to several years, are generally considered as stabilized. Many fact or scan influence tissue quality of a scar and can reactivate a scar, transforming it into a new wound. Mechanical forces, underlying pathology trauma, neoplastic transformation can induce reappearance of an evolutive wound. Usually, chronic wounds are exposed to recurrence. Pressure ulcers, diabetic foot ulcers, leg ulcers, but also irradiated skin, dermatological diseases and burns can be sources of unstable scars or atrophic scars or hyperkeratosis.
Different "standard" clinical situations can be encountered on after scars:

- A scar unstability can reflect either the absence or the poor quality of dermal component (absent or fibrotic) or the poor preventive measures taken against an external aggressive agent. A succession of healed and evolutive stages of the wound can be observed, rendering this wound particularly difficult to treat. Each episode of reopening of the skin can reproduce the preceding one, or be completely different in shape, size or depth.

- Hyperkeratosis is a common situation observed. It develops on the lower extremities, essentially on the plantar aspect of the foot or on the heel area. Density and texture of the hyperkeratosis creates a permanent risk of compression of the underlying structures, leading to mechanical conflict with shoes, a permanent pain in patients presenting normal sensoryendings, or a torpid progressive wound in patients having lost their sensitivity, like in diabetic patients or spinal cord injuries.

- Retractions of the skin can be observed on scars crossing a line of Langer or more frequently in chronic wounds. These scars tend to develop functional problems but also a permanent wound, sometimes associated with a local hyperkeratosis.

- Adhesion to depth can create a fixed point disturbing normal skin movements. This situation is observed during the post-operative period of pressure ulcer, on junctions between skin flap edges and the normal skin, but also on incisions submitted to a certain degree of tension (after skin resection, or skin grafting). When spontaneous wound healing is choosen, the same problems can be observed in the border of scar if shear forces occur. These scars can create folds on the junctions, susceptible to reopen if excessive mechanical forces are applied.

Recurrence of a chronic wound is the most frequent event. Its pathogenicity is not only local. A poor compliance to bandaging of a patient presenting a chronic venous leg ulcer, the lack of appropriated pressure relieving support in chronic pressure ulcers, a poor control of the diabetes are well known as factors favoring the recurrence of chronic wounds.

**MIDDLEKOOP Esther**

**BURN SCAR MATURATION AND PREDICTORS FOR SEVERE SCARRING**

Martijn BA van der Wal, MD, Jos FPM Vloemans, Wim E Tuinebreijer, Peter van de Ven, Ella van Unen, Paul PM van Zuijlen and Esther Middelkoop

Long term outcome of burn scars in relation with clinically relevant parameters is important to develop a prediction model for scar quality. Therefore, we conducted a detailed analysis on the clinical changes of burn scars in a longitudinal setup. In addition, we focused on the differences in scar quality in relation to the depth, aetiology of the burn wound and age of the patient. Burn scars of 474 patients were subjected to a scar assessment protocol 3, 6 and
12 months post burn. Three different age groups were defined (≤5, 5 -18 and ≥18 years). As expected, the observer part of the Patient and Observer Scar Assessment Scale revealed a significant (p<0.001) improvement in scar quality at 12 months, compared to the 3 and 6 months data. Predictors for severe scarring proved to be depth of the wound (p<0.001) and Total Body Surface Area (TBSA) burned (p<0.001). Interestingly, aetiology (p=0.753) and age (p>0.230) did not show significant influences on scar quality when corrected for sex, TBSA burned, time, burn depth and age or aetiology respectively. From these data it appears that children do not exhibit more scarring than adults, when we examine burns of similar size, depth and aetiology. In general, this model allows a more detailed prediction of scarring for specific groups of burn patients.

**MUSTOE Thomas**

Silicone gel in various forms has been well documented in multiple controlled trials to reduce scarring, but its mechanism of action for many years was unknown. There is a now an abundance of evidence that it is due to its occlusive properties which reduces water loss from the epidermis. Other clinical observations and lines of research point to the evidence that the epidermis has an important role in controlling scarring through cross talk with the underlying dermis. We have continued to investigate the signaling pathways involved in the epidermal control of scarring and have identified several potential therapeutic targets that are regulated and controlled by epidermal water loss. Mucosal wounds that heal in a liquid environment have minimal scarring and reduced epidermal signaling while cutaneous injuries with an immature stratum corneum have increased epidermal signaling. Interleukin 1 Beta, and downstream mediators play important roles. Cox-2 is highly regulated by epidermal water content, and preliminary results in the rabbit ear model suggest that local administration of a COx-2 inhibitor, celoxocib reduces scarring. Our rabbit ear hypertrophic scar model has also been useful in identifying therapeutic targets important in the dermis for regulation of scarring. Blocking Connective Tissue Growth Factor through antisense, or by local administration of statins reduces scarring in the rabbit ear model. Phase 2 human studies have demonstrated very encouraging results in the prevention of hypertrophic scars. Phase 3 studies are being pursued by Pfizer. If the rabbit ear model is predictive of human results, then intralesional statins may also be a promising treatment.
MULTOMODAL THERAPY FOR HYPERTROPHIC SCARS

Hypertrophic scars (HSs) become obvious within weeks after the injury was sustained, after which they rapidly increase in size for 3–6 months. Then, after a static phase, they begin to regress. However, for those HS cases with scar contractures (especially joint contractures) that could result in functional dysfunction, surgery is indicated. Releasing scar contractures improves joint function and also accelerates the maturation of surrounding immature scars and HSs. Small and linear HSs can be treated by complete surgical resection or nonsurgical multimodal therapy. In these cases, a type of tension-releasing technique, which includes z-plasty, w-plasty and small wave incision, should be applied to prevent the recurrence of HSs. Intractable recurrent HSs should be treated according to the keloid treatment algorithm, where the combination of surgery and adjuvant therapy is the treatment of choice. HSs without scar contractures improve naturally during the process of scar maturation. However, various nonsurgical therapies can accelerate this process and improve the subjective symptoms. Thus, it is recommended that HSs without scar contractures should be treated by one or more of the multiple nonsurgical therapies available, especially the noninvasive therapies, which include corticosteroid, stabilization, taping fixation, gel sheeting and laser.

CLASSIFICATION AND EVALUATION OF KEOIDS AND HYPERTROPHIC SCARS - A TRIAL OF JAPAN SCAR WORKSHOP

Japan Scar Workshop (JSW) has worked to establish the unified classification and evaluation system of keloid and hypertrophic scars since 2007. The many grey zones between typical hypertrophic scars and keloids in actual clinical situation make differential diagnosis a challenge. These two conditions, however, have been considered different in many traditional textbooks. They can also be considered unified as fibroproliferative disorders (FPD) of skin. Thus, we have attempted to develop a grading system for symptoms of these diseases. The purpose of this system is for every physician to become capable of adequately evaluating the degree of symptoms of hypertrophic scars and keloids and thus select appropriate treatment methods the results of which can be evaluated accurately. The first system that we developed was deliberated upon at the 4th JSW meeting in 2009 at which we requested the JSW members to use it in actual clinical situations, then the latest system was deliberated this year. We encourage international participants of this 4th Scar Club Meeting in Montpellier to voice out their opinion as it will help us in developing an “international classification and evaluation system of the fibroproliferative disorders of the skin.”
IMPORTANCE OF TENSION REDUCTION FOR PATHOLOGICAL SCAR MANAGEMENT

We are using evidence-based algorithms to treat abnormal scarring, including keloids and hypertrophic scars (HSs). Our finite element analysis of the mechanical force distribution around keloids revealed high skin tension at the keloid edges and lower tension in the keloid center. Moreover, when a sophisticated servo-controlled device was used to stretch wounded murine dorsal skin, it was observed that the stretched samples exhibited upregulated epidermal proliferation and angiogenesis, which are also observed in keloids and HSs. Real-time RT-PCR also revealed that growth factors and neuropeptides are more strongly expressed in cyclically stretched skin than in statically stretched skin. These findings support the well-established notion that mechanical forces on the skin strongly influence the cellular behavior that leads to scarring. These observations led us to focus on the importance of reducing skin tension when keloids/HSs are surgically removed to prevent their recurrence. Clinical trials revealed that subcutaneous/fascial tension reduction sutures, which apply minimal tension on the dermis, are more effective in reducing recurrence than the three-layered sutures used by plastic surgeons. Moreover, we have found that by using skin flaps (e.g., perforator flaps and propeller flaps), which release tension on the wound, in combination with postoperative radiotherapy, huge keloids can be successfully treated.

CURRENT OUR ALGORITHMS FOR THE TREATMENT OF BURNED SCARS, KELOIDS AND HYPERTROPHIC SCARS

We are using many methods to treat burned scars and abnormal scarring, including keloids and hypertrophic scars (HSs). In this session, I will present typical cases treated by taping fixation, gel sheets, corticosteroid, Nd: YAG laser, radiation, and surgery including z-plasties, w-plasties, small wave incisions, skin grafting, and flap transfer.

ROQUES Claude

MANAGEMENT OF HYPERTROPHIC SCARS – PHYSIOTHERAPY

Second and third degree deep burn scars treated by managed healing, the graft periphery and the meshed grafts net evolve and pass by an inflammatory stage responsible for redness, hypertrophies, indurations, retractions and adhesions. These phenomena are also observed in other types of scars. This maturation lasts approximately one year for scars, 18 months for burn scars. Compression has been used since 1970; several histological studies confirm the effectiveness of pressure therapy on scar maturation and allow assumptions about its action mechanisms. Although controversy remains over the issue, a significant weight of opinion and experience supports the contention that compression garments facilitate control of broad areas of hypertrophic scarring. Pressure therapy in various forms,
temporary or final, flexible or rigid, helps to reduce the scar after-effects and makes part of a vaster therapeutic strategy. The physiotherapy is often useful to improve the aesthetic or functional consequences of scars; the means of rehabilitation used to treat scars result for the most part of those used for the burn scars. They include hydration and massage, pressure therapy,

SCHULTZ Gregory

ANTI-SCARRING THERAPIES FOR CORNEAL AND CONJUNCTIVAL INJURIES

Excessive scarring of corneal and conjunctival injuries remains a serious complication that can ultimately lead to functional vision loss and failure of glaucoma filtering surgery. As in other tissues, scarring in these ocular tissues is regulated predominately by transforming growth factor β1 (TGF-β1), which binds to the TGFβ1 receptor (TGF-βR2) and induces the downstream mediator, connective tissue growth factor (CTGF). The most effective antisense oligonucleotides (ASO) and small interfering RNAs (siRNA) that target these key genes were assessed for knockdown of the target mRNAs and proteins in cultures of corneal fibroblasts and bEND cells. Treatment with ASOs to TGFβ1 or CTGF significantly reduced corneal scarring and failure of rabbit trabeculectomy surgery sites, and Phase II clinical studies with CTGF-ASO significantly reduced visual appearance of abdominal skin incisions and revised hypertrophic scars. In vitro studies with single, double, and triple combinations of siRNAs targeting these three genes synergistically reduced levels of type 1 collagen mRNA and alpha smooth muscle actin in cultures of rabbit corneal fibroblasts by 99% without reducing cell viability. Initial experiments with epigenetic regulating drugs also show promise as antiscarring agents. The FDA approved histone deacetylase inhibitor, suberoylanilide hydroxamic acid (SAHA), significantly reduced TGFβ-stimulated transformation of cultured fibroblasts into myofibroblasts and SAHA treatment also reduced rabbit corneal scarring. Both broad acting epigenetic drugs and gene-specific drugs show promise as antiscarring agents.

STEINSTRASSER Lars

POTENTIAL OF CUTANEOUS INNATE IMMUNE EFFECTOR MOLECULES FOR THE WOUND-HEALING SCAR RESPONSE

Host defense peptides (HDPs) are short cationic molecules produced by the immune systems of most multicellular organisms and play a central role as effect or molecules of innate immunity. Host defense peptides have a wide range of biological activities from direct killing
of invading pathogenstomodulation of immunity and other biological responses of the host. Increasing antibiotic resistance has led to an urgent need for new therapeutic approaches. HDPs have important functions in multiple, clinically relevant disease processes and their imbalanced expression is associated with pathology in different organ systems and celltypes. Furthermore, HDPs are now evaluated as model molecules for the development of novel natural antibiotics and immunoregulatory compounds. This review provides an overview of HDPs focused on their antimicrobial-immunomodulatory duality and highlights potential future developments in wound-healing and scaring.

**TEOT Luc**

**EPIDEMIOLOGY OF SCARS**

What are the practices of the patients with scars? Do they take care of the appearance of their scar(s)? Who are the medical prescribers and key players that treat and interact with patients with scar(s)? Patients with scars were questioned on the following topics: Socio demographic datas, description of the scars, impact of the scars on patients, treatment of the scar (improvement or reduction)

This series of 919 patients from France (236), Germany (226), Italy (236) and Spain (221) was contacted from November 25th to December 16th 2010. The results of the analysis are described in term of exposure of the scar (74%), location (arm elbow hand finger 34%), size (68% have small scars), discomfort (aspect, itching, pain), incidence of proposed treatment § 55% had some treatment). Self medication represents 36%, dermatologist clinic 35%, GP 34% of the patients, plastic surgeons 12%.

More than 65% of the patients are unhappy with their scars and would like to improve the aspect and the quality of life

**INTEREST OF V-LOC IN RECONSTRUCTIVE SURGERY**

The first description of using barbed sutures for tendon repair was published in 1967. The design evolved into a bi-directional suture with barbs positioned in a helical pattern via a micro-machining technique.

Covidien launched the V-Loc Absorbable Wound Closure Device in 2004. V-Loc is a unidirectional suture with a loop at the distal end. Barbed sutures are fabricated from monofilament fibers using a technique of micro barbing. The anchoring of the barbed suture defines the “continuous interrupted” suture.
By minimizing knots, the inflammatory reaction in a wound is decreased, increasing the blood flow coming to the wound, enhancing wound healing and decreasing the incidence of wound dehiscence.

In this series of V-Loc in flaps on 28 paraplegic patients, the interest of the long term resorbable suture on pathologic scarring and dehiscence is enhanced

**TREDGET Ed**

**THE ROLE OF PERIPHERAL BLOOD MONONUCLEAR CELLS IN HUMAN HYPERTROPHIC SCAR**

**Tredget TE, Lui HB, Momtazi M, and J Ding.**

**Introduction:** Hypertrophic scar (HSc) is a poorly understood fibroproliferative disorder which develops following injury into the deep dermis of the skin and results in significant cosmetic and functional limitations for patients, but responds poorly to currently available therapies. Our group has identified increased numbers of bone marrow-derived peripheral blood monocytes (PBMCs) including fibrocytes in patients with severe fibrosis of the skin, which home to the skin via stromal derived factor–1 (SDF-1) released by injured tissues before binding to CXCR4 receptors on the surface of PBMCs. PBMCs contribute to fibrosis directly by collagen synthesis and indirectly through paracrine signalling via TGF-β and connective tissue growth factor (CTGF), in HTS patients similar other fibrotic conditions.

**Aims:** The objective of this study is to further characterize the circulating PBMCs in burn patients which develop HTS and to investigate their role in dermal fibrosis in the scar tissues after transplantation of human skin in vivo using a series of immune-depleted mice lacking T cells, NK cells and NKT cells.

**Methods:** After ethics approval and informed consent, PBMCs where isolated from burn patients and normal controls before FACS analysis was performed for collagen 1, CD14, 34 (hematopoietic stem cell marker), 45 (leukocyte common antigen), 68 (pan-macrophage), 204 (M2 macrophage), LSP-1 (leukocyte specific protein-1), and CXCR4. Athymic mice were grafted with human abdominal skin (25 mice per strain) and evaluated at 30, 60, 120, and 180 days post-operatively by photography and scar rating analysis, as well as histological analysis and RT-qPCR.

**Results:** A distinct subpopulation of PBMCs was identified post-injury in burn patients, which was Col-1+ and CD14− but LSP-1+, CD34+, CXCR4+ and TLR4+ consistent with fibrocytes. However, 41% of these cells were also CD68+/macrophages, where 74.8% were CD204+/M2 macrophages. >95% of mice in each strain developed firm, elevated scars macroscopically, which resembled human HTS, where scar thickness was 541±2 μm for nude mice versus 157±3 μm for normal, uninjured skin (p<0.0001, paired t-test). Histologically, mouse scar biopsies demonstrated abundant, disorganized collagen fibers, increased vascularity and hypercellularity characteristic of HTS, as well as reduced expression of decorin, a small
leucine-rich proteoglycan, abundant in normal skin in humans and mice, but decreased in fibrotic human skin grafts in each strain of mice, similar to human HTS.

**Discussion:** thermally injured patients who develop HTS have a unique population of PBMCs which include fibrocytes and M2 macrophages early after burn injury. Nude mice which lack T cells still develop fibrosis in human skin post-grafting resembling HTS suggesting that fibrocytes and M2 macrophages are important in the development of fibrosis, but T cells and their subsets appear to be less critical.

**Acknowledgments:** Canadian Institutes for Health Research, FFBT Fund, U of Alberta.

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**VAN ZUIJLEN Paul**

**DEFINING THE MEDICAL NECESSITY FOR SCAR REVISION**

Burn injuries may result in scars with poor functional and cosmetic outcome despite the best available treatment strategies. Most significant scar features are stiffness, contracture, itching, relief, hypertrophy and aberrant colour. Conservative treatment options are frequently applied such as pressure therapy, silicone application, massage, etc. Questions why, when or how to operate must be carefully considered. The medical necessity for scar revision is related to function, appearance or complaints like itching. Location, size, natural course, and aetiology must also be taken into account. Treatment strategies should be based upon an understanding of the pathophysiology. Scars may be (partially) excised or, in case of contracture, released. Ideally the surrounding healthy skin should be considered for scar reconstruction by means of advancement, expansion, or transposition. In other cases skin grafts or skin replacements (tissue engineering) should be considered. When the main goals is to improve the cosmetic aspects of the scar other treatment options such as dermabrasia, microneedling and laser therapy may be indicated.

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**Symposium Medapharma**

**THE NEW SCAR MANAGEMENT PRACTICAL GUIDELINES**

**Chairman:** TEOT Luc  
**Speakers:** MONSTREY Stanislas, BASSETTO Franco

A multidisciplinary team of 24 European experts achieved consensus on the treatment of three types of scars: linear hypertrophic scars, widespread scars and keloids. They developed new scar management guidelines (Fig. 1).
• The starting point was the document published in 2002 by the International Advisory Panel on Scar Management (Mustoe T and al., Plast Reconst Surg. 2002 Aug; 110 (2): 560-71).

• New evidence emerged since 2002 and new developments were reviewed by the Expert group.

![Scar management practical guidelines](image)

*Fig. 1: Scar management practical guidelines*
There is scientific evidence in favor of the use of silicone therapy in clinical trials. The trials on the use of silicone sheets showed evidence of effect on pliability, erythema and itch. Other studies on the use of silicone gel showed some evidence on itching and that pressure has advantage working effect on thickness of the scar.

Practical cases with silicones will be also presented. The main goal is to give a practical approach of silicone gel and sheets in accordance with the new scar management guidelines.
Close Wounds Up to 50% Faster\textsuperscript{1,2}

Plastic surgeons can now experience a revolutionary knotless wound closure device.

The new V-Loc\textsuperscript{TM} 90 and V-Loc\textsuperscript{TM} 180 absorbable wound closure devices provide plastic surgeons with a unique technology that requires no change to standard closure techniques, delivering:

- Speed
- Security
- Potential to reduce knot-related complications
- Cosmesis comparable to standard sutures\textsuperscript{3,4}

\textbf{Secure}
Unidirectional barbs distribute tension across the wound

\textbf{Fast}
Close wounds up to 50% faster\textsuperscript{1,2} than conventional sutures

\textbf{Effective}
Has the potential to reduce knot-related complications
Oral and poster presentations

CLINICAL CASE REPORT

01. USE OF ALVEOLATE PRESSURE SPLINTS OR THE TREATMENT OF SCARY SURFACES AND CHELOIDS
02. CAN SINGLE USE NEGATIVE PRESSURE WOUND THERAPY BE AN ALTERNATIVE METHOD TO MANAGE KELOID SCARRING? A PRELIMINARY REPORT OF A CLINICAL AND ULTRASOUND / COLOR – POWER – DOPPLER STUDY
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04. POST-SURGICAL SCAR ACTIVITY – FACT OR FICTION
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07. A SYSTEMATIC REVIEW OF THE PSYCHOMETRIC PROPERTIES OF BURN CONTRACTURE SCALES REVEALS THE NEED FOR A NEW TOOL TO MEASURE OUTCOMES
CLINICAL CASE REPORT

01. USE OF ALVEOLATE PRESSURE SPLINTS FOR THE TREATMENT OF SCARY SURFACES AND CHELOIDS

Oral presentation

BRAYE Fabienne, VOULLAUME Delphine, GUILLOT Michel
Romans Ferrari Rehabilitation Center, La Chanal, 01700 Miribel, France

Background: The prevention and treatment of hypertrophic and cheloid scars is not solved yet. Physiotherapic, physical, biological and surgical procedures can be used. In the field of burns the most effective prevention is an early and aggressive rehabilitation program, which must start before inflammation begins. For the treatment of pediatric burns, and later for cheloids, the rehabilitation center developped a new means of compression. Instead of an homogenous compression, as provided by usual splints and pressure garnments, the splints are alveolate and provide an irregular pressure on the scary tissues (DMDG).

Objectives: A 10 years retrospective study concerns 5000 in-bed patients. All types pediatric of burns are observed. In our study a special attention was given to cheloids and extensive hypertrophic areas. Total in-bed treatment and the requirement for reconstruction were considered.

Methods: The apparatus is called DMDG®. It is hand made and customized to provide hyperpressure on sectorial and well targeted adherence areas. It can be weared under all types of dressings, compressive clothes and splinting. It is applied as soon as healing is acheived. It is used in association with other classical treatments such as positioning, immobilization and high pressure showers.

Results: DMDG hastens the maturation of hypertrophic scars. The adjunction of this treatment decreased of 25% the average total indoor treatment. The need for reconstructive surgery dramatically decreased during this period. Thanks to it’s efficiency it is possible to decrease the time of wearing and so improve the compliance of the patient.

Discussion: Alveolar compression allows the application of very high pressures on targeted areas, while avoiding wounding. Although no randomized study was realized the development of this apparatus transformed the treatment and outcome of pediatric burns.

02. CAN SINGLE USE NEGATIVE PRESSURE WOUND THERAPY BE AN ALTERNATIVE METHOD TO MANAGE KEOLOID SCARRING?
A PRELIMINARY REPORT OF A CLINICAL AND ULTRASOUND / COLOR – POWER – DOPPLER STUDY

Oral presentation

M. Fraccalvieri, A. Sarno*, E. Zingarelli, M. Salomone, S. Bruschi
Plastic Surgery Unit, Hospital S. Giovanni Battista of Torino, University of Torino, Italy (Chief: Prof. S. Bruschi) ; Radiology Unit, Hospital S. Giovanni Battista of Torino, Italy (Chief: Dr. MT. Cammarota)

Background: Keloid scarring represents a pathological healing in which the primary healing phenomenon is deviated from the normal.

Objectives: Pico® (Smith&Nephew, Hull, UK) is a single use negative pressure wound therapy system originally introduced to manage open or just closed wounds. Pico is composed of four layers dressing in which the deepest one (in contact with the lesion) is made of silicone, connected through a tube to a pump that distributes a 80 mmHg negative pressure therapy across the wound bed. In our thoughts the combination of silicon layer and constant and continuos compression, could be a valid method to manage keloid scarring.

Methods: Since november 2011 we enrolled for
this study 3 patients with keloid scarring. Patients were evaluated before the negative pressure treatment, at the end of treatment (one month) and two months later through the Vancouver Scar Scale (VSS), the Visual Analogic Scale (VAS) and a scoring system with one to three + for itching. Furthermore, for every patient an ultrasound (US) and color-power-doppler (CPD) examination was done to evaluate the thickness and the vascularity of the scar in the same period of time.

**Results:** One patient was discharged from the study after 1 week. In the last two patients VSS, VAS and itching significantly improve after one month therapy and the results were stable after two months without any therapy. At the end of the therapy the “appearance of palisade vessels” disappeared in both cases at CPD exam and US showed a thickness reduction (35-40%) for both keloids. After two months without any therapy CPD showed no vascularity and US a less further keloid thickness reduction.

**Discussion/Conclusion:** We propose a well-tolerated, non-invasive treatment to manage keloid scarring. Prospective studies are necessary to investigate whether these preliminary observations are confirmed.

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**03. SURGICAL TREATMENT OF DEPRESSED SCAR WITH INTEGRA SINGLE LAYER TEMPLATE MATRIX (ISL)**

**Oral presentation**

**Dr Giovanni Uberto**  
**HMM Plastic Surgery Unit**

**Background:** Contemporary options for the improvement of depressed scars include scar revision with an elliptical excision, z-plasty, w-plasty, and geometric broken-line closure. Dermabrasion and laser treatment has been used to obtain a uniform skin surface. When scars are hypertrophic, intralesional steroids and silicone pressure therapy may be useful. Occasionally, scars may be adherent to the underlying fascia. The resulting depression along the length of the scar worsens the aesthetic deformity.

**Objectives:** In the presence of a depressed scar in deep tissue, we began to use Integra single layer matrix (a porous matrix of cross-linked bovine tendon collagen and glycosaminoglycan. The collagen-glycosaminoglycan biodegradable matrix provides a scaffold for cellular invasion and capillary growth).

**Methods:** In the presence of adherent scars, the entire cicatricial area is totally eliminated down to the deep plane (aponevrotic, muscular, bone). The ISL is applied over the deep plane before wound closure and mild undermining of the edge of the wound were performed on one patient. The four patient treated three were post surgical scar and one was myelomeningecele scar.

**Results:** All the four patient describe a dramatic improvement after the surgery. We experienced no recurrence of adherence to deep plane and the scars were elastic and soft.

**Discussion/Conclusion:** This technique is a useful addition to the surgeon’s resources when treating scars.

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**04. POST-SURGICAL SCAR ACTIVITY – FACT OR FICTION**

**Oral presentation**

**Dr Anil K Luniya**  
**City & Country – Thane West, India**

**Abbreviations Used:** Low Level Laser Therapy (LLLT)

**Background:** Millions of patients undergo varied surgeries every day. Millions havethereafter beenleft withunexplained pains lasting their
lives, with no relief from conventional treatments available.
One of the potential reasons for this multitude of pains is the post-operative scar, no matter what size.
Apart from pains, scars may be the cause of different types of illnesses which may not manifest directly as a cause of surgery/scar.

**Objectives:**
1. To establish the dynamic activity of scar tissue even after several years of surgery
2. Showcase the variety of illnesses with multi-organ involvement - caused by scars

**Methodology:** 10 clinical cases presented with scar induced manifestations:
Interstitial Pulmonary Fibrosis, Severe Degenerative disease of joints, Chronic Low Backache/ PID, Chronic recurrent Vertigo, Recurrent Bleeding PV/PR, Galactorrhoea, OA & Eczemas, Microvascular Angina & Retrobulbar Neuritis, Complex Mixed Polyneuropathy, Neurogenic Bladder.
Details of examination, treatment modalities, duration and response to treatment will be discussed.

**Results:** All patients have shown Scar as a cause of multi-organ ailments. Significant improvements to cure following scar radiation with LLLT, given daily to weekly, over few days to years, have been documented.

**Conclusion:** Scar is a LIVE and Dynamic Tissue. It continues to fire electrical impulses all over the body causing Myofascial Pains in different parts of the body.
Multi-organ ailments not responding to conventional treatments have responded to treatment of scars with LLLT.
It is suggested that scar evaluation, irrespective of duration, should become a part of routine clinical examination and the symptoms correlated thereafter. Scar treatment could prevent multitude of sufferings, unnecessary investigations, medications and different forms of psycho-social issues.

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**05. MICRONEEDLING ON MATURE BURN SCARS: A CASE SERIES REPORT**

**Oral presentation**

P. Moortgat¹; C. Lafaire¹,², MD; K. Maertens¹,³

¹ OSCARE, Organisation for burns, scar after-care and research, Merksem, Belgium; ² ZNA Stuivenberg, burn center, Antwerp, Belgium; ³ VUB, Vrije Universiteit Brussel, Brussels, Belgium

**Background:**
There are very few therapies that can improve mature burn scars with non-surgical techniques. Microneedling is a minimally-invasive technique that needs little after-care and is widely used for skin resurfacing. Literature on its effect on mature burn scars is scarce.

**Objectives:**
The main objective of this report is to investigate and discuss the effects of microneedling on several characteristics of mature burn scars.

**Methods:**
Skin elasticity was examined with Dermalab® Elasticity meter and skin fold thickness with a Harpenden® skin fold caliper. A clinical assessment of the scar by both the patient (POSAS-P) and the observer (POSAS-O) was obtained by the POSAS.

In total 11 burn patients were treated once with microneedling, The scars were on average 85 months old. The patients were tested before the treatment, after one month and after three months.

**Results:**
The results showed a significant improvement (p<.01) over time for skin fold thickness with 13%. The results of the POSAS-P showed a significant improvement over time for pliability (p<.04) with 25% and global score (p<.03) with 34%. The POSAS-O results showed a significant improvement over time for pliability (p=.006) with 34%, thickness (p=.005) with 37%,
Discussion: Microneedling can give added value to the non-surgical treatment of hypertrophic, irregularly shaped, mature burn scars. In the future, a comparison with a control group and a bigger sample size are necessary. An objective measurement of the scar texture and a distinction between specific indications are also desirable.

06. STRATEGY FOR TREATING EAR KELOIDS

Poster presentation

Mai Watanabe, Satoshi Akaishi, Teruyuki Dohi, Hiko Hyakusoku, and Rei Ogawa
Dept. of Plastic Surgery, Nippon Medical School, Tokyo, Japan

Background: In our facility, patients with keloids on the upper part of the auricle and/or the earlobe are treated with multimodal therapy that consists of simple or core excision followed by postoperative radiation.

Objective: We report the outcomes of this algorithm for treating ear keloids.

Methods: Earlobe keloids were extirpated involving a minimal margin of normal skin. The excision was made from the anterior to the posterior earlobe, and the keloid was hollowed out. After surgery, 5 Gy of electron-beam irradiation was delivered for 2 days starting from the day after the operation. Keloids on the upper part of the auricle were treated by core excision, the inner fibrous core of these auricular keloids was excised, and a flap with a superficial dermis and subcapsular vascular plexus was elevated. The flap was then closed by simple suturing with perichondrium. Electron-beam irradiation (5 Gy/day) was delivered for 3 days starting from the day after the surgery.

Results: In our facility, before 2002, all ear keloids were excised completely and then subjected to post-operative electron beam irradiation (15 Gy/3 fractions/3 days), with the recurrence rates for keloids on the earlobe and the upper part of the auricle as 5.7% (n=35) and 38.5% (n=13), respectively. After 2002, the treatment algorithm described above was introduced. The recurrence rates for both ear regions are now below 10%.

Discussion / Conclusion: Previous articles support our observations regarding the effectiveness of excision and postoperative radiation for ear keloids. We were able to successfully reduce the total dose of radiation needed to prevent keloid recurrence on the ear. Moreover, our observations suggest that for the upper part of the auricle, the core excision method may be better than simple direct suturing since it prevents mechanical stress on the wound that could promote the recurrence of the keloid.
01. THE RELATIONSHIP BETWEEN SKIN STRETCHING / CONTRACTION AND PATHOLOGICAL SCARRING

Oral and Poster presentation

Yuki Nagashima¹, Kazuhisa Okai², Fumio Tokumura³, Kazuyuki Mori², Yasutaka Ohmori¹, Chenyu Huang, Satoshi Akaishi¹, Hiko Hyakusoku¹, and Rei Ogawa¹
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Backgrounds: Keloids tend to occur on highly mobile sites with high tension. This study was designed to determine whether body surface areas exposed to extreme strain during normal activities correlate with areas that show high rates of keloid generation after wounding.

Methods: Eight adult Japanese volunteers were enrolled to study the skin stretching/contraction rates of nine different body sites. Skin stretching/contraction was measured by marking eight points on each region and measuring the change in location of the marked points after typical movements. Moreover, the distribution of 1500 keloids on 483 Japanese patients was mapped.

Results: The parietal region and anterior lower legs were associated with the least stretching/contraction, while the suprapubic region had the highest stretching/contraction rate. With regard to keloid distribution, there were 733 on the anterior chest region (48.9%) and 403 on the scapular regions (26.9%). No keloids were reported on the scalp or anterior lower leg.

Discussion / Conclusion: Since the scalp or anterior lower legs are rarely subjected to skin stretching/contraction, it appears that mechanical force is an important trigger that drives keloid generation, even in patients who are genetically predisposed to keloids. Thus, mechanotransduction studies are useful for developing clinical approaches that reduce skin tension around wounds or scars for the prevention and treatment of not only keloids but also hypertrophic scars.

02. THE EFFECTS OF PRUS® DEPRESSOMASSAGE ON PAIN, PRURITUS AND SENSORY PERCEPTION IN BURN SCARS

Oral presentation

J. Meirte¹² drs, M. Anthonissen¹⁶ drs, L. De Cuyper¹⁴ MD, U. Van Daele¹ PhD, P. Moortgat¹, K. Maertens¹³ drs, W. Vaneerdeweg⁵ MD PhD
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Background: Pruritus and pain due to scarring are estimated to affect 87% of the adult burn population. Pain and paresthesia in burn patients in the aftercare setting are poorly documented. Besides the conventional physiotherapy, new methods are developed to influence these impairments.

Objective: The main objective of this study is to investigate the effect of PRUS®
depressomassage on pain, pruritus and Pression Perception Threshold (PPT) in burn scars.

**Methods:** Pain and pruritus were examined with the Patient and Observer Scar Assessment Scale. Cutaneous sensibility was measured with the Semmes Weinstein® aesthesiometer to determine PPT.

33 burn patients were treated with PRUS® depressomassage (test group) and 15 burn patients were treated with conventional physiotherapy (control group).

Both groups were comparable at baseline on several clinical factors. Data were registered at baseline, after one, three and six months, and again after one year.

**Results:** The within group analysis showed a significant (p=.028) reduction of pain (33%) in the test group after one year compared to baseline. The control group showed no significant changes in pain.

In the test group pruritus diminished (26%) significantly (p=.011) after one year compared to baseline. The control group first showed a significant decrease of pruritus at six months but this was not confirmed after one year.

In the test group the PPT improved (50%) significantly after one year compared to baseline (p=.000). The PPT of the control group showed no significant changes after one year compared to baseline.

Results of the between group analysis revealed no significant differences between the test group and the control group.

**Conclusion:** In conclusion the PRUS® depressomassage has a positive effect on pain, pruritus and PPT in burn scars.

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**03. 3D DIGITAL STEREOPHOTOGRAMMETRY**

**A RELIABLE AND VALID TECHNIQUE FOR MEASURING SCAR SURFACE AREA**

**Oral presentation**

C. M. Stekelenburg, M.B.A. Van der Wal, D.L. Knol, H.C.W de Vet, P. P.M. Van Zuijlen

*a Association of Dutch Burn Centres, Beverwijk, the Netherlands ; b Department of Plastic and reconstructive Surgery, Red Cross Hospital, Beverwijk, the Netherlands ; c VU University of Amsterdam, the Netherlands*

**Background:** Measuring surface area is important for evaluating scar features such as hyperpigmentation, hypertrophy or contracture. 3D stereophotogrammetry is a technique that allows for surface area measurements. This study was performed to investigate the reliability and validity of 3D digital stereophotogrammetry in measuring surface area of scars.

**Methods:** For 3D imaging Quantificare LifViz was used. This technique uses an adjusted camera that makes two images of the same object at the same moment. These images are digitalized into a 3D reconstruction from which geometric calculations can be made. Two independent clinicians photographed the scars to assess reliability and subsequently the scar surface was traced on a transparent sheet to assess the validity.

**Results:** A total of 50 scars of 32 patients were photographed. The 3D stereophotogrammetry showed good reliability with an intra class correlation of 0.997 and a coefficient of variation of 6.8%. To visualize the differences between the two observers, data were plotted and the limits of agreement calculated at 0 +/- 0.19. Also, excellent validity was found with an intra class correlation coefficient of 0.994. Data were plotted in a Bland and Altman plot showing limits of agreement of -602mm² and 928mm².
04. ON SKIN AND SCAR PIGMENTATION

Oral presentation

M.B.A. van der Wal [a,b,c], W.E Tuinebreijer [b], D. Wellenstein [a], P.P.M. van Zuijlen [a,b,c,d] and E. Middelkoop [a,b,c]  
[b] Association of Dutch Burn Centers, Beverwijk, The Netherlands; [c] Department of Plastic, Reconstructive and Hand Surgery, Research institute MOVE, VU University Medical Centre, Amsterdam, the Netherlands; [d] Department of Plastic, Reconstructive and Hand Surgery, Red Cross Hospital, Beverwijk, The Netherlands

Objectives: The objectives of this study were two-fold. 1. To validate two objective color measurement instruments for the purpose of normal skin color assessment. 2. To investigate the influence of skin color on burn scar quality.

Methods: Part 1. 134 individuals were measured with the DermaSpectrometer and 122 with the DSM II ColorMeter after being subjected to the Fitzpatrick skin type classification scale. Spearman’s correlations were calculated between the instruments and the Fitzpatrick scale. Part 2. 603 burn victims were assessed with the Patient and Observer Scar Assessment Scale at three, six and twelve months after the injury. In addition, patients and scar characteristics were documented including skin and scar color measurements. A linear mixed effect model was used for the analyses.

Results: Part 1. Correlations were strong (Spearman’s >0.75) between the parameter melanin of the DermaSpectrometer and the DSM II on the one hand and the total Fitzpatrick score on the other. Part 2. Overall scar quality was not significantly (p = 0,385) influenced by the level of pigmentation of the normal skin. Higher levels of pigmentation did result in significantly lower vascularization scores and significantly higher pigmentation scores. Furthermore, overall scar quality improved significantly in time (p = 0,000). The total body surface area burned and burn depth negatively influenced scar quality (p = 0,000).

Conclusion: In this study, the melanin score of the DermaSpectrometer and DSM II ColorMeter was validated for objective skin color assessment. Furthermore, we conclude that in a burn population, skin color has no significant influence on overall scar quality, when corrected for other variables such as total body surface area burned, wound depth, and time after the injury.

Background: A dark skin is often associated with a higher incidence of pathological scarring. We attempted to further unravel the relationship between skin color and scar quality in a population of burn patients.
01. TOPICAL APPLICATION OF OLIVE OIL ACCELERATES WOUND HEALING

Oral and Poster presentation

M. Otranto (1, 2), L. Pessoa(1), F. Garcia (1), A. Desmoulière (2), A. Monte-Alto-Costa (1).
(1) Department of Histology and Embryology, State University of Rio de Janeiro, Rio de Janeiro, Brazil ; (2) Department of Physiology, Faculty of Pharmacy, University of Limoges, Limoges, France

Background: Fatty acids are considered to be effective components to promote wound healing. Olive oil (OO) mainly consists of monounsaturated fatty acids.

Objectives: The aim of this study was to investigate the effects of topical application of OO on cutaneous wound healing. The viability of L929 fibroblastic cells was also analyzed after OO treatment.

Methods: On day 0, excisional wounds were performed on the back of healthy rats and immediately treated every other day with topical applications (200 µL) of mineral oil (MO) or OO for 6 days. Contraction and re-epithelization were determined by measurements on days 0, 2, 5, 7 and 14 after wounding. Then, rats were euthanized and lesions removed; one fragment was paraffin-embedded and the other was frozen to perform hydroxyproline assay. Sections were stained with hematoxylin-eosin and Sirius red and the expression of α-smooth muscle actin (to detect myofibroblasts) and nitric oxide synthase-2 (NOS2) was studied by immunohistochemistry. L929 cells were treated with OO (0.01 or 0.1 mg/mL) for 6 or 24 hours.

Results: Seven and fourteen days after wounding, contraction and re-epithelialized area were greater in OO group compared with MO group (p<0.005 and p<0.05 respectively). After 14 days, inflammatory infiltrate was moderate in OO group compared with MO group. Collagen deposition (with thin and short collagen fibers in OO group), density of myofibroblasts (p<0.05), NOS2-positive cells (p<0.01), and hydroxyproline amount (p<0.001) were lower in OO group compared with MO group. After 6 hours of treatment, L929 cell proliferation was significantly increased after treatment with 0.01 mg/mL of OO, but lower after treatment with 0.1 mg/mL of OO. After 24 hours of treatment, no difference was observed with both concentrations.

Discussion/Conclusion: Our results suggest that the topical application of OO accelerates cutaneous wound healing; in vitro study shows that, in our conditions, OO was not cytotoxic for L929 cells. Certainly, monounsaturated fatty acids are involved in this effect.

02. MECHANICAL PERFORMANCE OF 2-OCTYLICYANOACRILATE TISSUE ADHESIVE

Oral presentation

Lukas Capek¹, Ladislav Dzan²
[1] Technical University of Liberec, Department of Applied Mechanics, Studentska 2, 46117 Liberec 1, Czech Republic ; [2] Regional Hospital Liberec, Department of Maxillofacial Surgery, Husova 10, 46001 Liberec, Czech Republic

Background: Research into tissue adhesives has attracted attention in medical field due to their potential ease of use. It’s generally suppose to use tissue adhesives only for small lacerations and skin wounds.
**Objectives**: The aim of this study was to compare the tensile strength of 2-octylcyanoacrylate tissue adhesive with efficiency of knots made on stitches during closing skin wound. For this purpose we carried out a few tests.

**Methods**: For the first experiments we carried out standard tensile tests with human skin grafts. These specimens were cut in the middle and glued together with the tissue adhesive Dermabond®. The two-column testing machine was used for applying the load to the specimens until the failure. The second test consisted in determination of efficiency of joined suture by different square knots. For these purposes several tensile tests were performed.

**Results**: The force deformation curves obtained from uniaxial tensile tests carried out with the glued skin specimens were nonlinear. The mean force leading to this failure was set to 5.6 ± 0.5 N. The maximum force leading to failure of the specimen joint was the most important value for maintaining the skin still glued. When using one square knot for jointing the Dafilon® suture the maximal applied force was 1.09 ± 0.03. When using two square knots for jointing the Dafilon® suture the maximal applied force was 7.4 ± 0.3.

**Conclusion**: There is lack of information regarding the limitations of tissue adhesives from a mechanical point of view. The purpose of this study was to show the tensile strength of the tissue adhesive Dermabond® in laboratory conditions. When comparing the maximal load needed for failure of the joint, it can be seen that there is no range different between gluing and knotting.

**Introduction**: There are approximately 24,000 Americans who developed burn contractures annually. Elucidating the signals that promote persistent fibroblast activation in burn contractures is necessary to develop better therapies. Angiotensin II (AngII) is known to cause organ fibrosis. The role of AngII in burn scar contracture has not been studied. The project determines the role of AngII in promoting contractures.

**Methods**: Human dermal scar contractures were immunostained for AngII receptor 1 (ATr1) and AngII receptor 2 (ATr2). Contractures were studied in ATr1 KO mice and wild type mice were treated with losartan or Ang II. To determine mechanisms of action, human dermal fibroblast and myofibroblast contractility was assessed in response to AngII in vitro. To verify the role of myofibroblasts in AngII mediated contraction, alpha smooth muscle actin knockout animals were treated with AngII.

**Results**: Human scar contractures showed increased expression of ATr1 compared to surrounding normal skin. ATr1 KO mice and losartan treated animals showed reduced wound contraction. AngII expedited wound contraction. Tissue architecture, collagen production, proliferation, and epithelialization were not significantly altered by losartan. AngII promoted FPCL contraction in an ATr1 dependent manner. AngII promoted human scar fibroblast expression of alpha smooth muscle actin, non-muscle myosin, collagen and Rho kinase. AngII stimulated wound contraction was not significantly different in wild type and alpha smooth muscle actin knockout mice.

**Conclusions**: ATr1 expression in upregulated in scar contractures. Receptor blockade of AngII by genetic KO and pharmacologic approaches decreases dermal contractures. AngII stimulates myofibroblast formation but myofibroblasts are not necessary for AngII stimulated contraction in vivo. AngII signaling may be a target for preventing scar contracture.

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**03. ANGIOTENSIN II IS A TARGET TO PREVENT BURN SCAR CONTRACTURE INDEPENDENT OF MYOFIBROBLASTS**

**Oral presentation**

J. Bond, R Licheng, G Kokosis, L Chen, A M Selim, and H. Levinson

*Duke University Medical Center, Durham, NC, USA*
04. ABNORMAL TERMINAL DIFFERENTIATION & INCREASED THICKNESS OF THE EPIDERMIS IN KELOID SCARS

Oral presentation

GC Limandjaja, FB Niessen, S Gibbs
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Background: The pathogenesis underlying keloid formation remains elusive and research has mostly focused on abnormalities in the dermal compartment. The epidermis has not yet been fully characterized.

Objective: Identify differences within the epidermis of keloids, normotrophic and hypertrophic scars in order to distinguish potential diagnostic biomarkers.

Methods: Keloids (n=10) were compared to normal skin (n=5), normotrophic (n=10) and hypertrophic scars (n=10). Epidermal thickness and rete ridge formation was evaluated. Immunohistochemical stainings were performed to assess epidermal proliferation (Ki67), epidermal differentiation (K10, involucrin, loricrin, SKALP) and epidermal activation (K6, K16, K17).

Results: Keloids have a significantly increased number of epidermal cell layers compared to normal skin (p<0.001), normotrophic (p<0.01) and hypertrophic scars (p<0.05). All scars showed a reduced number of rete ridges compared to normal skin, although only normotrophic scars and the central keloid region reached statistical significance. While K10 expression was normally expressed in the suprabasal epidermis in all tissue samples, the early differentiation marker involucrin surprisingly showed abnormal expression in scars. In healthy skin, involucrin was restricted to the granular layer. However, in keloids, panepidermal involucrin expression was observed. Normal scars expressed involucrin in the granular and upper spinous layer. Hypertrophic scars demonstrated a mixed phenotype with both aforementioned expression patterns occurring at equal frequency. There was no difference in epidermal proliferation between different tissue types. Keratins 6/16/17 were largely absent from all samples.

Discussion: Keloids have increased epidermal thickness compared to normal skin, normal scar and hypertrophic scar. This is not due to hyperproliferation, but is possibly caused by abnormal early terminal differentiation. Our findings support the role of the epidermal compartment in keloid pathogenesis and identify involucrin as a potential diagnostic marker for adverse scar formation.

05. KNOCKING OUT SMAD-3 CONSTITUTES A MICROENVIRONMENT FAVORED FOR THE DEVELOPMENT OF TRANSPLANTED FETAL SKIN

Oral presentation

K Liu, Z Gao, X Wu, W Liu
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Background and objective: Many investigations have been performed for fetal scarless wound healing mechanism. Previous studies indicated that fetal skin contains skin progenitor cells and low expression levels of TGF-beta 1 and 2. We proposed that wound skin regeneration may need skin progenitor cells and an optimal microenvironment, which respectively constitute “seed” and “earth” parts of tissue regeneration, and deleting TGF-beta signaling may create a microenvironment favored for skin regeneration.
In this study, we tested the skin regeneration hypothesis using transplanted fetal skin and smad-3 knock out mouse.

**Methods:** E16 fetal skin was harvested from GFP transgenic mouse (C57 background) or Lac Z transgenic mouse (129 background) and respectively transplanted to wide type (WT), heterozygous (HT) and homozygous Smad3 knock-out (KO) mouse wounds (C57/129 backgrounds) and the transplanted skins were characterized at 1, 2 and 3 weeks post-transplantation.

**Results:** At 1 week, all transplanted skin survived well. Skin developed well in KO wound with hair follicle formation and there was no fibrotic tissue in the central part. In contrast, fibrotic tissue was widely formed in transplanted tissue of WT wound with significantly increased thickness and few hair follicles formation. There was fibrotic tissue and some hair follicle formation in HT wound. At 12 days, sever wound contracture occurred in WT wound where less contracture was observed in KO wound. At 14 days, GFP was observed in HT and KO wounds but not in WT wound. Histologically, mature hair follicle structure was observed only in KO wound, but not in HT and WT wounds. At 3 weeks, residue GFP with some remained hair follicles were observed only in KO wound but not in other two groups. Quantitative analysis revealed significantly increased thickness and less numbers of hair follicles in the transplanted tissues of WT wound than those of HT and KO wounds (p<0.05). Similar results were observed in Lac Z skin transplantation model. Furthermore, when fetal skins with same genetic background (C57/129) were transplanted, much faster hair follicle formation was observed in KO wound compared to other two type wounds.

**Conclusion:** Knocking-down smad3 in a wound creates a better microenvironment for skin progenitor cells to develop into skin appendage structure.

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**06. THE POTENTIAL USE OF PLATELET RICH PLASMA IN THE TREATMENT OF BURNS**

**Oral presentation**

R.E. Marck\(^1\), E. Middelkoop\(^2,3\) and R S. Breederveld\(^4\)

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**Background:** Platelet rich plasma (PRP) is a fraction of blood plasma with a platelet concentration above baseline. After activation of the platelets growth factors are released, which are involved in wound healing processes, like angiogenesis, promoting vascular in-growth and fibroblast proliferation. Application of a multitude of growth factors could boost the healing process of soft and hard tissue.

**Objectives:** We aim to clarify the many aspects of PRP and the evidence for its use in different fields of surgery and wound care. Furthermore we want to investigate the potential use of PRP in the treatment of burns.

**Methods:** We performed an extensive search of the literature on PRP and especially on PRP and burns in Pubmed and Ovid.

**Results:** Many publications on PRP were found, however studies with high level of evidence were rare. PRP has been reported to have beneficial effects on wound healing in different fields of surgery and in the treatment of acute, chronic and diabetic wounds. However, there are some reports which show little or no significant contribution of PRP. There is a high variety in PRP products, procedures and content, which makes interpretation and comparing evidence difficult. Literature on the use of PRP in
burns is scarce with only one animal study and one controlled study in friction burns.

Conclusions/Discussion: A deep dermal burn could theoretically benefit from PRP through its haemostatic abilities and the positive effects on wound healing: possibly enhancing re-epithelisation and take rates of skin grafts. However burn patients have a different physiological state than the healthy subjects studied mostly. Little is known on how burns may affect platelet function. Furthermore the long term effects of PRP on scarring have not yet been evaluated properly. Future research is needed to elucidate the role of PRP in the treatment of burns.

07. A SYSTEMATIC REVIEW OF THE PSYCHOMETRIC PROPERTIES OF BURN CONTRACTURE SCALES REVEALS THE NEED FOR A NEW TOOL TO MEASURE OUTCOMES
Poster presentation

H. Levinson, T. Ehanire, J. Bond, K. Slaughter, J. Vissoci, C. Rodriguez, R. Pietrobon
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Background: Scar contractures affect approximately 40% of major burn patients. There are several approaches to treat burn contractures and optimize activities of daily living (ADL); however, it is unknown which therapy is best. To evaluate treatments, a psychometrically valid scar contracture tool that measures ADLs among a diverse group of burn patients needs to be identified.

Objectives: To identify, analyze, and compare the validity, reliability and factor analyses of all scar scales that measure ADLs in burn patients.

Methods: Articles concerning burn injury assessment and ADLs were identified by searching PubMed (September 1959 to July 2011), EMBASE, LILACAS, APA PsycNET, citation tracking using the “cited by” Google scholar tool, hand searching of relevant journals, and correspondence with experts. Eight hundred nine articles were reviewed.

Results: Our search yielded 764 articles which were narrowed down to seventy-two based on title, abstract, and full-text review. Thirty were excluded for either lack of reported psychometric analyses, ADL evaluation, or use among burn patients. The forty-two articles that met eligibility discussed eleven scales, of which six were developed specifically for burn patients and five were developed for non-disease specific clinical assessments but have been used in burn patients. A common strength was good reliability. Common weaknesses included few publications reporting factor analyses, insufficient evidence on scale sensitivity to changes over time, poor sample variability in psychometric analyses studies, and lack of data on content validity specific to ADL assessment.

Discussion/Conclusion: There is insufficient data on the dimensionality and responsiveness of existing scales to affirm their use for measuring ADL in burn patients. Existing scales do not comprehensively measure ADLs as an isolated parameter. A self-reported burn contracture assessment scale, needs to be developed so that we can optimize burn contracture treatments and develop new therapies.
Lamalou les Bains, le 20/03/12

Le pôle inter régional de prise en charge des grands brûlés de la Clinique STER développe depuis maintenant plus de 30 ans une prise en charge spécialisée des patients grands brûlés.

Cette unité de rééducation hyperspecialisée a été l’une des première en France p rendre en charge les grands brûlés adultes après leur séjour en réanimation.

Composée d’une équipe pluri-disciplinaire comprenant : IDE, kinésithérapeutes, ergothérapeutes, aides-soignantes, assistante sociale, psychologue, entourée par deux médecins spécialistes, cette équipe dédiée, prend en charge des patients dès leur sortie de réanimation.

Des soins cutanés spécialisés sont réalisés à la Clinique (massages manuels et mécaniques, ultra-sons, eau silicatée, étirements stretching, relaxation, maquillage correcteur, appareillage...).

Ces techniques de prise en charge doivent permettre aux patients ayant été victimes de brûlures graves, d’éviter au maximum le préjudice esthétique et fonctionnel.

La Clinique travaille en collaboration avec les CHRU de Montpellier, de Toulouse, de Marseille, de Pointe à Pitre, l’Hôpital des Armées de Toulon.

Elle répond à un besoin inter régional de prise en charge des grands brûlés en rééducation.

Situé au cœur du village de LAMALOU LES BAINS, le service permet aux patients victimes de brûlures, de débuter également leur réhabilitation et de pouvoir être au contact quotidien de la population du village qui est souvent le premier regard extérieur après la brûlure.

Fort de son expérience sur la prise en charge des grands brûlés, la clinique a également développé une expertise dans la prise en charge des plaies chroniques et des cicatrices complexes, thème de ce congrès.

Docteur N. FRASSON

Médecin Coordonnateur
Speakers presentation

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Full professor of Plastic, Reconstructive and Aesthetic Surgery, Director of the Residency program in Plastic, Reconstructive and Aesthetic Surgery of the University of Padua (Italy) and of the Master in Aesthetic Surgery of the same University, specialized also in Hand Surgery and Director of the Unit of Hand Surgery of the University Hospital of Padua. Author of more than 110 publications in national and international literature and supervisor of more than 50 research projects and grants including clinical trials. Member of more than 18 scientific national and international societies in the field of plastic and reconstructive surgery.

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Bernard Coulomb is a cell biologist working at INSERM (Institut National de la Santé Et de la Recherche Médicale). He has been working on *in vitro* skin reconstruction for more than 25 years. Using the technology developed by E Bell in 1979-81 in animals, he developed human skin models, which contributed to the understanding of human skin physiology, pharmacology and...
pathophysiology. By this way he demonstrated the important role of dermal fibroblasts in epidermal behavior and the modulation of fibroblast functions by both the extracellular matrix and the epidermis. In parallel, he investigated the possibility of using living reconstructed skin to graft patients with giant naevi or burn injuries. These clinical investigations showed that fibroblasts are key elements in dermal substitutes, promoting rapid reorganization of a functional dermis. Looking at alternatives to the use of dermal fibroblasts, he compared phenotype and functions of fibroblasts derived from various tissues including Mesenchymal Stroma Cells (CSM) derived from bone marrow. On the basis of the observation that adult tissues and organs of a same person are not equal in front of wound healing, he contribute to demonstrate the concept that the efficacy of repair of gingival fibroblasts in the embryo-like repair of adult gingiva (without scar and fibrosis) can be transposed to another tissue, i.e. arterial wall. He is now involved in the development of this cell therapy strategy to treat abdominal aorta aneurisms at the PARCC (Paris Cardiovascular research Center) at HEGP (European Georges Pompidou Hospital) in Paris.

In parallel to his research work, Bernard Coulomb serves on the Board of ETRS and is Basic Science Editor at the Journal Wound Repair and Regeneration.

Alexis Desmoulière was awarded a PhD from Bordeaux University (France), in 1987. Dr. Desmoulière became assistant Professor in the Department of Pathology at the University of Medicine, Geneva (Switzerland), in 1988. He has worked at the “Institut Pasteur” and at the “Institut de Biologie et Chimie des Protéines” in Lyon (France) between 1993 and 1998, in Bordeaux (France) at the University Victor Segalen between 1998 and 2006, and is now Professor of Physiology at the Faculty of Pharmacy, University of Limoges (France). His interest in wound biology extends over many years, and he has published widely on scar formation and the role of fibroblasts in wound healing.
**DEREURE Olivier**  
France

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**Special domains of interest:**
- role of virus in skin benign and malignant proliferations
- biology and clinical pattern of cutaneous lymphomas
- chronic wounds
- auto-immune skin disorders
- cutaneous side effect of drugs
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Dr Dolynchuk is a Plastic Surgeon from Winnipeg, Manitoba, where he did most of his training. He is currently an Associate Professor in the Department of Surgery in the section of Plastic Surgery at the University of Manitoba. The focus of his practice is Wound Healing and Scar Management. He has clinical as well as bench top research activities, which he participates in with collaborations around the world, He belongs to numerous wound healing professional societies being active in the Wound Healing Society and the Canadian Association of Wound Care. He has published extensively, and holds various patents for treatment of hypertrophic scars.
GURTNER Geoffrey  USA

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Geoffrey Gurtner’s Lab is interested in understanding the mechaehnism of new blood vessel growth following injury and how pathways of tissue regeneration and fibrosis interact in wound healing.

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Medical School and Residency in Innsbruck, Austria, European board examination (EBOPRAS) in 2007.
Chief of Plastic Surgery Services at General Hospital Linz since 2008.
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Main interests: lasers, scars, wound-healing processes, photodynamic therapy, AKs and carcinomas, anti-aging: fillers, botulinum toxins
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Dr. Liu graduated from Shanghai Second Medical University in 1983 with a MD degree and graduated from University of Arkansas for Medical Science in 1998 with a PhD degree followed by two year postdoctoral training on wound healing at Institute of Reconstructive Plastic Surgery of New York University. He has been a plastic surgeon since 1983 and now mainly focuses on basic and applied researches of tissue engineering and wound healing after his return to China in 2000. Currently, Dr. Liu is a Professor of Plastic Surgery of Shanghai Jiao Tong University School of Medicine with the clinical role in scar treatment, and Associate Directors of Shanghai Tissue Engineering Center and Shanghai Institute of Plastic and Reconstructive Surgery, Chief Scientific Officer of National Tissue Engineering Center of China. Dr. Liu is the principle investigator of four national key projects of tissue engineering research sponsored by Chinese Ministry of Science and Technology. Dr. Liu is the organizer of 8th TESI annual meeting and was elected as the Council Member of TERMIS Asia-Pacific Chapter. Besides more than 40 original articles published in international journals, he has contributed several invited review articles in Tissue Engineering, Biomaterials and Current Gene Therapy, etc. He currently is the editorial board member of Journal of Tissue Engineering and Regenerative Medicine, Biomaterials and Special Issue Editor of the journal of Tissue Engineering and has presented more than 20 invited speeches at various international conferences. Dr. Liu’s clinical work focuses on keloid and scar treatment and he currently serves as the Scientific Committee Member of International Scar Club based in Montpellier, France and has presented keynote and invited speeches in Scar Club meetings and in 2010 Tokyo International Scar Meeting.

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Head of dermato-geriatric department and wound care unit (94 beds) in Hospital Rothschild (Assistance Publique – Hôpitaux de Paris)
She also carries a master degree from the University of Paris in Molecular Biology (1990), Immunology (1990) and Molecular pharmacology (1991).
She participated on university trainings in Dermatology, Wound Healing and Gerontology, since 1988 at the University of Paris 6, Université Pierre et Marie Curie (UMPC).
She was in charge of the direction of several thesis on advance wound care, management and epidemiology of chronic wounds (pressure ulcer, leg) and dermatological problems on elderly people.
She has produced more than 100 publications, on pubmed: wound healing, scar, management of pressure ulcers, venous leg ulcer, dressings assessment, nutrition, especially in elderly people.
She is
- co-founder of the French journal of Wound Care " Journal des Plaies et Cicatrisations"
- co-organiser of the French National Meeting "Conférence des Plaies et Cicatrisations" which take place every year in January in Paris
- co-organiser of AWT (Academy of Wound Technology) since 2006, in Europe, Asia, North America and Middle East
- co-founder of Journal of Wound Technology (since 2008)
She is Presidente of the French Society of Wound Healing (SFFPC),
She is organizer of Paris VI University Diploma in Wound Care and Wound Management, since 1997

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Professor Dr. Esther Middelkoop studied chemistry at the University of Utrecht, and obtained a PhD in biochemistry in 1989. During some years she worked as post-doc at the biochemistry department of the University of Amsterdam, in the Academic Medical Centre.
In 1992 she started her work on skin replacement materials at the department of dermatology of the AMC. In 1996 she continued this work at the Burn Centre of the Red Cross Hospital in Beverwijk and with the Dutch Burns Foundation. She initiated several studies in the field of skin substitutes, wound healing and scar treatment, which lead a.o. to some 10 PhD-theses.
Association of Dutch Burn Centres. Esther Middelkoop is the research director of the organization. Since September 2006, she is also professor in Skin Regeneration and Wound Healing at the dept. of Plastic, Reconstructive and Hand Surgery of the Free University Medical Centre in Amsterdam.
Professor Mustoe has been involved in wound healing and scarring research for 20 years, with funding from the National Institute of Health for 19 years. He has been chief of plastic surgery at Northwestern U in Chicago since 1991. He has coauthored more than 200 articles and chapters, and served on Editorial Boards including Wound Repair and Regeneration, Plastic and Reconstructive Surgery, Archives of Surgery, Journal of American College of Surgeons. He is a past President of the Wound Healing Society. He has a strong clinical and research focus on scarring. He is on the board of directors of the American Board of Plastic Surgery.

Clinical Research Interests:
- Perforator Flap Surgery / Reconstructive Microsurgery
- Burn Reconstructive and Regenerative Surgery
- Keloids and Hypertrophic Scars Treatment / Scar Management
- Scar-less Wound Healing

Basic Research Interests:
- Cellular Mechanics / Mechanobiology
- Scar Biology
- Cartilage Tissue Engineering
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Dr. Schultz is a UF Research Foundation Professor and Director of the Institute For Wound Research. His research focuses on the molecular regulation of wound healing with special emphasis on antiscarring therapeutics in skin and eye injuries using gene targeted approaches with antisense oligonucleotides and siRNAs targeting TGFβ and CTGF.
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Honors, Awards and Scholarships
1999  General Motors Postdoctoral Research Scholarship University of Michigan,
2005  International Scholar of the American Society of Plastic Surgery
2006  European Diplomate for the Plastic Surgery Research Council
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2007  Adjunct Professor for the International Graduate School for Bioscience
2009  Von Langenbeck- Wissenschaftspreis German Surgical Society
      President of the European Plastic Surgery Research Council
2010  Heisenberg-Professor endowed by the German Research Foundation (DFG)
      Member of the American Association of Plastic Surgery (AAPS)
2012  International Editor for Plastic and Reconstructive Surgery (PRS)
      Section Editor for Journal Aesthetic Plastic Surgery (AePS)
      Editorial Board for the Journal European Surgical Research
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Dr. Edward (Ted) E. Tredget has been a member of the Division of Plastic Surgery and Director of the Firefighters’ Burn Treatment Unit of the University of Alberta Hospital as well as Director of the Plastic Surgery Wound Healing Research Laboratory since 1988. The main focus is tissue engineering as well as wound healing and fibrosis, particularly hypertrophic scar following burn injury. He was appointed Professor of Surgery at the University of Alberta in 1999, where currently he is the Director of the Division of Surgical Research and Senior Director of Research for the Department of Surgery at the University of Alberta.
VAN ZUIJLEN Paul
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Education
1995 - MD University of Amsterdam, Amsterdam, The Netherlands
2002 - Ph.D. Thesis: ‘Perspectives on burn scar evaluation and artificial skin’ University of Amsterdam, Amsterdam, The Netherlands
2006 - Registered as a Plastic Surgeon (April 1st)
2006 - 2008 - International Fellowship on burns and reconstructive surgery

Memberships
European Tissue Repair Society, International Society for Burn Injuries; European Burns Association; Nederlandse Vereniging voor Plastische Chirurgie; Nederlandse Vereniging voor Brandwondenzorg

Reviewer
Plastic and Reconstructive Surgery, Burns, The International Journal of Lower Extremity Wounds
Limit uncertainty with clinical experience and innovative products in upper extremity
Integra is dedicated to limiting uncertainty for the busiest surgeons, so they can focus on providing the best care for their patients. We manufacture and market medical products, pioneering the field of regenerative medicine. Integra’s products are used in surgery to treat millions of patients each year.

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We are one of the world’s largest suppliers of neurosurgical products, and provide a complete portfolio of products that neurosurgeons need to perform a multitude of delicate and complex surgeries. Our products are used in the neurosurgery operating room and in the neuro intensive care unit to monitor a patient’s condition.

**Extremity Reconstruction**

We are one of the fastest growing Integra businesses, dedicated to providing pioneering regenerative medicine technology that repairs skin, nerves and tendon, and metal internal fixation implants used in small bone reconstruction.

**Spine and Orthobiologics**

We offer the spine surgeon a comprehensive portfolio of spinal fusion technologies and a range of innovative bone graft substitutes that are used to enhance the repair and regeneration of bone in spinal and other orthopedic surgical procedures.

**Surgical Instruments**

We are a leader in surgical instruments, providing an extensive selection of surgical products to hospitals and surgery centers, as well as dental, podiatry, veterinary and physician offices. Integra is also a global leader in surgical headlight systems and table-mounted retractors used in surgery.

**Integra at a Glance**

- World leader in regenerative medicine
- 2010 revenues of $732.1 million; 21% 5-year Compound Annual Growth Rate
- Publicly traded NASDAQ company (“IART”)
- Recognized by Forbes magazine’s as one of “America’s 100 Best Small Companies” in 2010
- Headquartered in Plainsboro, New Jersey with offices and manufacturing facilities around the world