

Brief case reports about the use of Elasto-Gel hydrogel wound dressing.

Traumatic cases

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Case 1.

A 56 year old Caucasian male had crushed his right leg under a heavy vehicle. The process of freeing the father's leg from under the wheels of the vehicle by his son, caused a more complex injury. The man was brought to the nearest hospital, where the doctors decided to amputate his right foot.

The son did not accept the doctors' decision and drove another 100 miles to our hospital where he asked the orthopedic surgeon not to amputate the foot. The orthopedic surgeon stabilized the fracture and performed a fasciotomy to relieve the pressure from muscles and nerves. Shortly thereafter a multi-disciplinary team was formed with the orthopedic, plastic surgeon and the wound nurse. The initial dressing was a non adherent gauze dressing (Melolin, Smith & Nephew Ltd.) which is a standard procedure after such operations. This type of dressing only absorbs the wound exudate. The first days this dressing needed to be changed 3 times a day. When used longer than 4 days post operative it dries the wound completely. One week postoperatively , several necrotic spots developed. The whole right inner ankle towards the heel was a necrotic area. On the right lateral of the ankle and on the tibia were several dry necrotic spots (*see fig. 1 and 2*). The use of the non adherent gauze dressing caused these necrotic spots to get dry and hard. To overcome this problem we tried Silvadene (Duphar Medical Ltd.) in combination with cotton gauze but this did not work, because all the creme was absorbed by the gauze and was not effective any more. The removal and debridement of the **dry eschar** was accomplished by using IntraSite-Gel (Smith & Nephew Ltd.) with an hydrogel (Elasto-Gel, South West Technologies Inc.), cover, with an average duration of 8 days.

The patient was fitted with a Walker boot one week after the operation and was kept mobile throughout the treatment process. Before we used the hydrogel sheet ,it was very difficult with the cotton gauze dressing, because it was too thick to fit in the Walker boot. The hydrogel sheet was thin enough so rehabilitation was more comfortable for the patient, and provides a soft protective padding.

After many clinical trials and error with other types of dressings, we decided to use Elasto-Gel 30 cm X 30 cm because it could cover all the wounds (*fig. 3*).

Clinically , after *partial auto-debridement*, the extent of the loss of soft tissue proved to reach the tendon of the perineus, the Achilles and the periosteum of the tibia.

The wound was not infected and after the full auto-debridement granulation could start.

The next step of the treatment was to combine the Hydrogel with hydrocolloid paste (*see fig. 4*). These complex polysaccharides are known to enhance granulation formation.¹ At this stage a profusion of exudate was produced by the wounds. The hydrogel was able to absorb parts of it, and hold the remaining exudate fluid with an insubstantial leakage. Unfortunately the man was an unknown diabetic, a fact which was discovered by accident post traumatically. The patient was also found to have allergic reactions to some pain medications. The combination of the hydrogel and the hydrocolloid paste did promote the growth of granulation tissue very well (*see fig 5*). 47 days after the injury all wounds had fully granulated and split thickness grafts were applied. These grafts were covered immediately with the Elastogel dressing to protect and stabilize them, while the patient continued using the Walker Boot. These procedures gave a 95% take of the grafts. Within 6 weeks (after grafting) the patient no longer needed dressings or coverings and all wounds were healed (*fig 6 & 7*). The total treatment took 120 days. To preserve long term ankle joint mobility, rehabilitation was required to begin as soon as possible; preferably within a few days. In this case, using this new wound dressing and new techniques of wound care allowed this rehabilitation to begin while wound healing was in progress.



1. Leg one week after accident

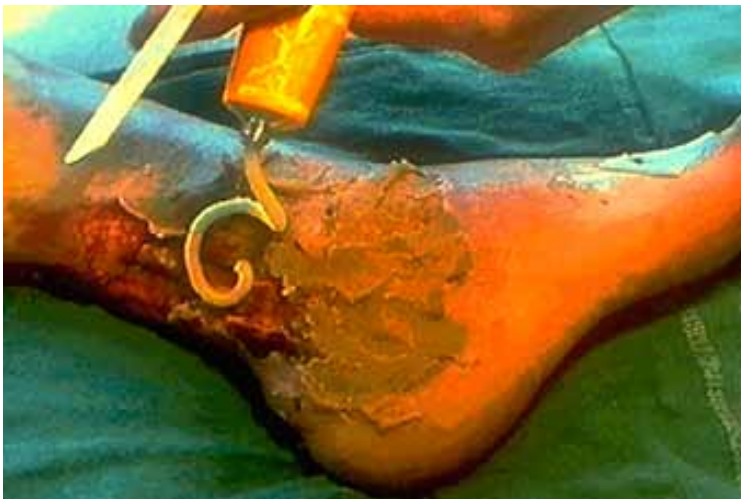
¹ PICKWORTH J. & DESOUSA N., *Angiogenesis and macrophage response under the influence of Duoderm*, in: *Wound healing* (Cederholm, Williams S., Ryan TJ, Lyndon MJ., eds), 1988, Experta Medica, Princeton, NJ; p 44-48.



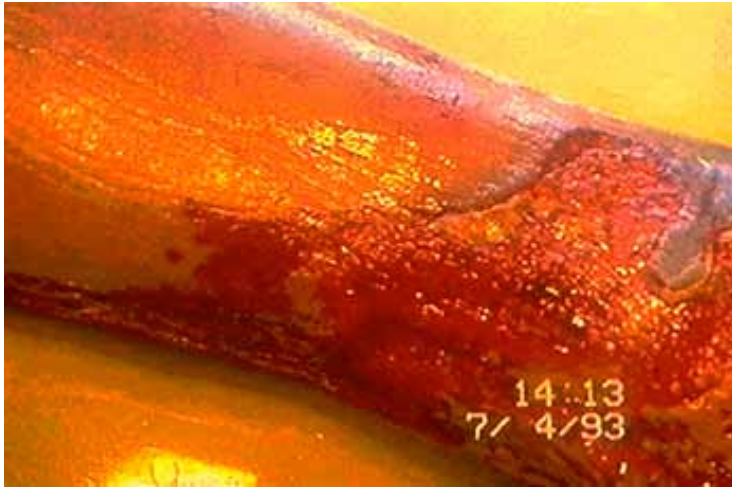
2. Wound one week after accident notice large fasciotomie and several hard necrotic spots.



3. Leg completely dressed in one large Elasto-Gel.
4.



4. Hydrocolloid paste as a primary dressing under Elasto-Gel.



5. Growing granulation tissue under Elasto-Gel



6. Final result after split thickness skin graft.



7. Final result after split thickness skin graft.

The dressing for wound management

Due to the presence of several kinds of wounds, such as, 1. dry eschar, 2. moist necrotic areas, 3. granulating fasciotomy wound, and the need to

protect the reconstructed fractured bones, we required a dressing with multiple functions. The dry eschar should be kept quite moist to be softened, while the granulating tissues also needed a moist environment, but excess exudate needed to be removed², and a protective cushion was needed. Separating each wound was not possible because there were multiple localizations and the wounds were very close together. Therefore, a large dressing which was capable of covering all of the wounds was needed. Because the patient was allergic to some pain medication, wound care needed to be conducted without or at least with minimal pain relief medication.

DISCUSSION

This paper described a case of a complex injury to the right leg. The injury caused, bone fractures and extensive localized soft tissue loss, which extended to tendons and periosteum of the tibia in some areas.

The treatment was started in a conservative way, using an Elasto-gel covering of 30 cm X 30 cm, combined with Intra-Site Gel to soften the dry eschar, and debridement of the necrotic soft tissue³.

The objective of the treatment for the next stage, was to stimulate the growth of granulation tissue, by using a hydrogel sheet combined with hydrocolloid paste. In no circumstances a secondary bacterial infection or foul odors occurred. The split-skin grafting followed. Postoperative there were no significant complications. This dressing could be left to cover the extended wounds for days, which reduced labor and cost. Considering that the patient was an unknown diabetic with a compound fracture, we conclude that this wound treatment procedure gave remarkably fast healing results.

Elasto-Gel has proven to have properties, which are exceptionally well suited to treating such a complex multitude of wound conditions that had to all be managed at one time. From the infection control of severely damaged tissue to the protection of broken bones and the padding and protection of the wound to the rehabilitation in the Walker Boot, Elasto-gel proved to be an excellent choice for the primary wound dressing. Specifically, Elasto-gel:

- was compatible with other dressings, medications and wound packing materials in complex wound care, which resulted in reduced cost of nursing labor.
- was able to absorb part of the exudate and contain the remaining exudate

² Winter G.D. *Formation of scab and the rate of epithelialization of superficial wounds in the skin of Young domestic pig.* Nature 1962 nr. 193, p. 293-294.

³ CHERRY G. ,*Scherisorb gel investigated, Care Sci. Pract.*, 1985, (Special edn.), p. 12- 14.

with minimal leakage. This is attributed to the high moisture vapor and oxygen transmission and the absorption capacity of 3 to 4 times its own weight.

- was easy to handle , apply and mildly adhesive.
- conformed to body contours and the elastic backing enables stretching with body movements (reduces friction and nerve irritation, resulting in less pain).
- is bacteriostatic and fungistatic and highly odor "absorbing".
- did not dry out and adhere to the wound or surrounding tissue.

Compared with a standard list of criteria of functions ⁴ a wound dressing should perform, Elasto-gel did quite well.

COMMENTS

This paper demonstrates the importance of a multi-disciplinary team approach to wound healing. But also the need to use and combine the many new dressings at different stages of wound healing, especially when dealing with complex multiple wounds. This will result in faster more efficient healing and better over all results. The new dressings have been developed to solve certain problems associated with wound healing.

A combination of dressings may be needed to achieve the best results.

Additional wound healing studies are needed to determine the best combination of dressings at each stage of healing.

Further research is necessary to elucidate the problems in wound care.

It is obvious that if we can continue to be successful at healing such difficult wounds, we can circumvent the amputation of limbs of some patients and possibly save the life of others.

Case 2.

A 45 year old Caucasian male had crushed his left leg under a Bobcat (small tractor).

The process of freeing the leg was not an easy job since the security system of the machine did not allow the farmer to open the machine immediately. It took about 4 minutes before the foot was freed from the crushing pressure. The big toe was severely damaged and a lot of bones inside were broken to.

⁴ THOMAS S. Wound Management and Dressings.
The Pharmaceutical Press, London, 1990.

In the hospital a pressing relieving fasciotomie was performed and some of the broken bones were corrected by the orthopedic surgeon. The foot was swollen and after a week a lot of necrotic tissue became visible. (Pic 1.) To soften the necrotic tissue Elasto-Gel was used. In a weeks time a lot of the necrotic tissue could be removed without pain medication. Due to the bacteriostatic action of the Elasto-Gel no offensive odors were noticed. After all of the necrotic tissue was gone (one toe was surgically removed) still Elasto-Gel was used to keep the wound free of bacteria and to promote the growth of granulation tissue. (pic 2.) The patient was discharged from the hospital after 21 days. He came two times a week for the change of his Elasto-Gel and was able to do light work at his farm. It took 4 months to heal the wound completely. Only the loss of one toe and some scars were the only reminder of the accident. The foot is fully functional again and farming is no problem at this moment. (pic 4 - 5.)



1. Wound one week after accident. The foot was severely crushed and already one toe is amputated. The foot was dressed in one sheet of Elasto-Gel.



2. Wound after one month of Elasto-gel treatment. All necrotic tissue has been removed and granulation tissue is present in all wounds.



3. Another month later all wounds on the side of the foot were epithelialized.



4. In the region of the big toe still some epithelialization has to occur. These wound has still been treated with Elasto-Gel.



5. 21 days later only a small area has to be epithelialized.

Case 3.

A 78 year old lady with Kähler disease had been a hip operation and was while being confused fallen out of her bed. She wounded the inner side of her left leg. From her upper leg to her ankle there were superficial wounds and hematoma visible. (pic. 1) A extensive debridement was the first step and after this sugar paste was put into the wounds and covered with a Hydrogel (Elasto-Gel, 30x 30 cm) sheet. (pic 2 & 3) In some cases doctors on Belgium like to use sugar paste into difficult to heal wounds. The Elasto-Gel was rapped around the whole leg and at the overlay fixated with an elastic tape. Skin tears which are commonly seen in Kähler's disease were avoided because we used Elasto-Gel and we applied the dressing in a special way. In picture 4 we can see the other big wound on the lower leg. After two weeks the wounds were clean and ready for split thickness skin transplantation.



1. Wound after extensive debridement ready for Elasto-Gel therapy.



2. Sugar paste is brought into the wound and kept in place for 3 days with Elasto-Gel.



3. All wounds were dressed in two sheets of Elasto-Gel. This method made it possible to save the delicate skin of the patient (no tape was used on the skin)



4. Wound on the lower leg nicely granulating.



5. Final result: Wound on upper leg is completely closed (graft has been dressed with Elasto-Gel to), on the lower leg only a small wound is still present.

Case 4. Motorcycle man case report.

The aim of care of this patient was to avoid amputation of his leg by debridement, protection and treatment of infection, pain reduction, healing of the wounds and providing as much comfort as possible.

Introduction

Complex traumatic wounds present tremendous challenge for the healthcare team. The dynamics of this exchange of energy will determine the magnitude of injury. Disruption of the body integument leaves the once-sterile underlying tissues exposed to contamination. The contaminants are derived from either the victim (endogenous) or the exogenous energy source. The presence of a contaminant such as bacteria makes the care of the wound an exercise in microbiology. Other contaminants, such as dirt, also may reside in the recesses of the wound. Gustilo¹ followed up on the management of open fractures, and in his article noted that infection rates between 3% and 25% were described in the literature. In many of these cases also gangrene is eminent and in the first week even the life of the patient is at stake. Even after stabilizing the patient, and the wound often multiple surgical procedures are required to correct all of the problems. At discharge the patient's ability to lead a normal life (without amputations) is the quality standard we need to achieve. In all stages the wound care team has to perform according to the highest standards. Infection prevention and providing the ideal wound healing environment are top priorities together with restoring limb function.



Picture 1 Situation a few hours after the accident

Case presentation

A 24 year old Caucasian male had a high energy accident with his motorcycle on the 8 of July 1995. He was admitted to the emergency room and upon examination, it was determined that his right knee was seriously injured and that his left tibia was broken together with severe loss of muscle tissue. (see pic.1)

There was considerable debate among the attending physicians when deciding whether to amputate the left leg or attempt to save it, because of the high potential for gangrene, which could result in loss of the whole leg or worse. The decision was made to attempt to save the leg.

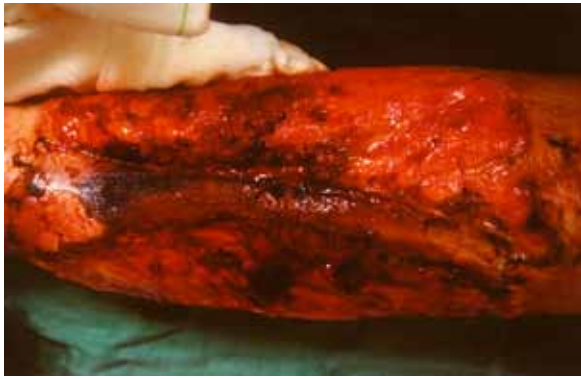


Picture 2. Fracture stabilized, and beginning necrosis visible.

The patient was immediately scheduled for operation and after cleansing of the wound, the broken left tibia was anatomically corrected with a pinless fixator (pic. 2). The damaged tissue was positioned in place as good as possible. After debridement skin was replaced without traction. The uncovered muscles were dressed with Epigard (Becton Dickinson) and covered with cotton gauze. The right knee was placed in a temporary cast.

Two days after the operation it was obvious that some of the tissue was not healthy. (pic. 2)

Some doctors began to consider amputation again, since the leg had a terrible odor and gangrene was considered eminent. However, twenty-four hours after an arteriogram, the doctors were more optimistic since the blood supply appeared to be better and the tissue regained color and appeared to be responding.



Picture 3. Wound before treatment with Elasto-Gel. Bone starts to dry out and turning black.

On the 14 of July (6 days after the accident, 4 days after arteriograf) a first clean up operation was performed. The pinless fixator was removed and a “unreamed tibianail” was brought in place. Since there was a lot of bone which was not covered with tissue, some doctors feared gangrene and again were considering amputation. A day after this clean up operation the exposed bone started to dry out and turned like black. (Pic. 3) The attending nurses suggested to overcome this problem, one should cover the bone with large pieces of Elasto-gel (30 X 30 cm), because past experiences showed bacterial growth inhibition and rehydration of bone and fat tissue in many large wounds. The doctors agreed and the leg was completely covered with Elasto-gel occlusive wound dressings.



Picture 4. The wound after 2 days treatment with Elasto-Gel. Compare with picture 3.

In addition, to prevent the possible gangrene the use of hyperbaric oxygen was a part of the treatment. It was administered 3 times a day for 30 minutes. Hyperbaric oxygen treatment has been used for over three months on this patient. Additionally, a systemic antibiotic IV treatment was administered the first 4 weeks after the accident and after every operation.



Picture 5. Whole wound is covered with one Ealsto-Gel.

The wound dressings were changed every 24 hours. The odor was reduced dramatically after 18 hours and was completely eliminated after 2 days. The appearance of the wound greatly improved.(pic.4)
 On the 18 of July a second clean up operation in preparation of the flap surgery was performed. Again Elasto-gel was used to dress the whole wound. (pic.5)



Picture 6. Wound after flap operation covered in Surfasoft. It is not possible to clean the wound nicely under the Surfasoft, therefore very soon a Pseudomonas aeruginosa infection does occur.

During this period regular cultures were taken to control the micro-burden. No infection has been seen during the Elasto-gel treatment. On the 25 of July two myocutaneous flaps were used to cover the bone areas. The first 4 days Surfasoft* (Mediprof) was used to cover the flaps. (pic. 6). Thereafter, Elasto-gel was used to help keep the wound moist and prevent infection. After 3 days a small acceptable necrosis of the flap was present. The operation was a success.

On the 8 of August a final flap operation was completed. Elasto-gel was used as a primary dressing because of previous Pseudomonas aeruginosa infection with Surfasoft.

Only a small part of the bone is not yet covered.

On the 5 of September a last correctional operation was performed and the exposed tissue was completely covered with split thickness skin grafts.

The donor sites were covered with Surfasoft and the skin grafts were dressed with Elasto-gel. After three days the donor sites became infected with Pseudomonas

aeruginosa, but the graft sites were completely free of infection. The donor sites were then covered with Elasto-gel and 5 days after the Elasto-gel therapy was started the *Pseudomonas aeruginosa* was gone (pic. 7).



Picture 7. Donor sites which were infected with Pseudomonas A. and treated with Elasto-Gel for 3 days turned free of Pseudomonas aeruginosa.

After 21 days of treatment with Elasto-gel a thick jelly clot covering the skin graft wound was present. (pic.8)



Picture 8. Jelly clot formation on the Skin grafts under Elasto-Gel.

After removal of this fibrin-Glycerine substance, the jelly clot, an almost complete take of the skin grafts were noted.(pic. 9)

On 13 of September little holes were drilled in the uncovered bony part of the wound. This wholes were filled with pieces of bone grafts form the pelvis from the patient. This procedure often restores life in the dead bone. The bone grafts were covered with DuoDerm paste (Convatec Ltd.). Every 2 days the DuoDerm paste was renewed.

This treatment was used for 2 weeks and stopped since there were no obvious signs of a positive effect. The DuoDerm paste was continued for stimulation of growth of the surrounding granulation tissue. (pic. 9)



Picture 9. When jelly clot was removed healthy skin grafts were found.

On October 6; since there was only a small area of bone still needed to cover. On the 28 of November a cross-over flap (from the other leg) was performed. (pic. 10) A cast of plaster of Paris was made to keep the legs together. A external pin fixation was not possible because of the presence of the tibianail. The first week a Surfsoft (Mediprof) dressing was used on the open wounds. Again a Pseudomonas infection developed.

After this Elasto-Gel was used to cover all the wounds (pic. 10). It was quit difficult for the nurses to dress the wound since there was not enough space left and the patient was not able to turn in his bed. Elasto-Gel was used for two main reasons: it was the only dressing which could easily be shaped to the contours of the wound and because of the difficulty to clean the wound (weakening of the cast) we needed a dressing which could battle the present Pseudomonas infection.



Picture 10. Cross over flap in the window left in the cast of plaster of Paris to fixate both legs.

On the 5 of December a correctional operation was needed to secure the flap. Two months later the flap was split and the patient had both legs free again. The operation was a success. The flap on the left leg was healthy and the blood flow was excellent. (pic 11).



Picture 11. Leg after cutting of the cross over flap.

The wounds were again treated the first week with Surfsoft (Mediprof) and thereafter Elasto-gel was used to dress the wounds.

(Pic. 12)

Immediately after this operation active rehabilitation was performed and after 4 weeks the patient was able to walk successfully again. Only a nasty scar on both legs will remind him on this accident.



Picture 12. Elasto-Gel molded up and around the wound.

Conclusions

The treatment of such a severe traumatic wound and fractures is complex and requires the full and ongoing attention of all the members of the wound care team. The goal to save the leg of the patient was more than worth it, but it took several operations and quite some time. Also the patient had a very difficult time after immobilization and sometimes painful rehabilitation procedures were needed. The combination therapy, hyperbaric oxygen therapy, Elasto-Gel, systemic antibiotics was able to prevent a possible anaerobic gangrene. We believe that the use of Elasto-Gel was essential to the success.

This dressing was able to keep almost all of the exposed tissue and bone alive. When Pseudomonas infections were occurring only Elasto-gel was a major contributing factor to stop the infection due to its bacteriostatic action. (reference Miami study).

The weekly contacts between the members of the wound care team were evaluated as very valuable.

The respect and recognition of each knowledge and skills created a climate of professionalism.

If doctors and nurses join forces a special form of quality is established in the world of patient care.

*(Surfasoft is a standard dressing in plastic surgery in our facility, it acts like a second skin and does not stick to the wound in the beginning, after 4 to 5 days its starts drying in the wound at makes it often painful to remove from the wound. Mainly for this reason we are considering to switch immediately or after a few days to Elasto-Gel.)

References
