THE WHASA WHEEL – Integrating multiple specialities in patient management with wound healing as the common basis

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Introduction

There is not a speciality in Medicine that I can think of today where Wound Healing does not impact. The surgical specialities by their very nature involve the healing of wounds in one form or another, but it is not always appreciated that almost every chronic medical condition also has associated wound problems. This reality results in an unprecedented amalgamation of medical minds and basic scientists all contributing to a surge in knowledge related to this relatively new field.

The WHASA (Wound Healing Association of Southern Africa) WHEEL is a concept that has been developed to demonstrate the impact of interspeciality co-operation for the ultimate benefit of the patient. This article, by means of a hypothetical case, attempts to demonstrate this co-operation and to highlight esoteric situations that arise when considering wound healing among the different fields. It is by no means exhaustive of surgical scenarios but merely representative of fairly common situations that any of us could encounter on a daily basis.

The article takes the form of a case report which is interspersed with 'wound healing' discussions that I have added under the heading 'WHASA background comments'. In addition invited comments from our esteemed colleagues that make up the components of the WHASA WHEEL are included within the text.

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Case report

A 57 year old male patient was seen in Trauma Casualty following a motor vehicle accident. Initial examination revealed polytrauma including a head injury, blunt abdominal trauma and a compound fracture of the left tibia. His medical history included that of a type 2 diabetic on oral medication in an otherwise healthy male.

The patient responded to pain and withdrew in response to pain with incomprehensible verbal responses. He was assessed as a 10/15 Glasgow Coma Scale score head injury but pupils were equal and responsive to light. Examination of the abdomen revealed ecchymotic areas with an underlying tense distended abdomen. Palpation confirmed fullness of the abdomen with percussion tenderness. A diagnostic peritoneal lavage showed the presence of more 200 000 RBC/mm^3 constituting a positive result for an intra-abdominal bleed. Examination of the left leg revealed an obvious compound fracture of the upper third of the tibia and a weak pulse in the posterior tibial artery region of the left lower limb. The ankle-brachial pressure index was assessed to be 0.6. Sensation to the foot was intact.

Following initial resuscitation and external reduction and splinting of the tibial fracture, the patient was transferred to the operating theatre under the care of the trauma surgeon, orthopaedic surgeon and a vascular surgeon. A straight X-ray and on-table single-shot femoral angiogram revealed a tibial plateau fracture and a suspected transected popliteal artery with associated thrombosis (Figure 1).

Exploration of the abdomen revealed injury to the small bowel mesentery with significant bleeding and pressure necrosis of the peritoneal fascia and abdominal wall muscle. Following control of the bleeding, debridement of the necrotic mesentery, fascia, peritoneum and muscle and thorough washout of the abdomen, total closure of the abdominal wall was not possible and the abdomen was packed and closed with a broad polyurethane temporary 'sandwich' dressing with the intention of returning the patient to theatre in 72 hours once compartment pressure had reduced and the patient considered stable for further surgery.

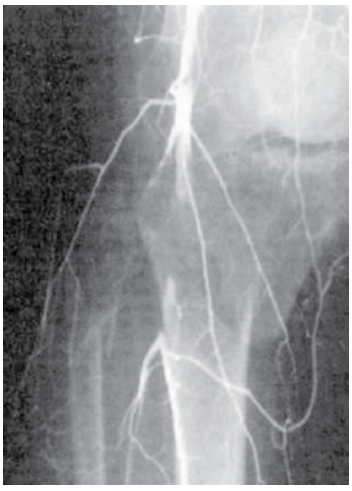

Figure 1: Tibial plateau fracture with severed popliteal artery

Comments from WHASA Wheel partner – Trauma surgeon: Prof Ken Boffard

This patient's blood pressure is not recorded. If the patient is stable, he would probably get a CT scan of his head, abdomen, and a CT angiogram of his leg. If unstable, either the DPL or a FAST ultrasound would be appropriate. The priorities would be to minimise secondary brain damage through hypotension, and if there are signs of shock, the abdomen takes priority.

The leg has a tibial fracture, in its upper third. This is generally below the trifurcation, and sensation is intact. This implies that since there are three vessels at this point, and the mechanism of injury is not

compatible with transection of all three, that the most likely cause of the pulseless leg is positional, possibly with compartment syndrome. In the emergency department the fracture should be reduced and back-slabbed, or traction applied.

The X-ray (Figure 1) shows an upper tibial fracture, with popliteal transection, but reasonable collaterals. In this patient, on-table angiography is appropriate in the absence of CT angio.

There is injury to small bowel mesentery, bleeding and necrosis of fascia and abdominal wall muscle. (Presumably due to a crush injury). There is no mention of the general condition of the patient, specifically lactic acidosis. However, this patient fits the criteria for damage control, which implies haemostasis and any contamination control. This patient should have any mesenteric and other bleeders tied off, and then the operation should be terminated. No attempt should be made, in the presence of other injuries, to resect dead muscle. The abdomen should be thoroughly washed out. Any oozing should be judiciously packed.

NO attempt should be made to close the abdomen at this stage, and specifically the fascia should not be primarily repaired, grafted, or sutured. This case is ideal for an "Opsite Sandwich negative pressure dressing." Use of the proprietary VAC dressing at this stage is not indicated due to the risk of abdominal compartment syndrome. Equally, now is not the time to waste time on the abdomen.

Figure 2A: Temporary Opsite® negative pressure sandwich dressing

The sheet is placed on the intestines and spread between the gut and abdominal wall laterally with the plastic in contact with the bowel.

This allows the bowel to bulge out if pressures are high (Figure 3).

Two large suction drains are secured to the outside of the covered surgical drape to control fluids. A large Ioban® or Opsite® is placed from the nipples to the groins.

Case report continued

Thus the abdominal injury was addressed by the trauma surgeon. Simultaneously the vascular surgeon repaired the injured popliteal artery by a femoro-popliteal bypass using autologous saphenous vein harvested from the contra-lateral limb. Complete heparinisation was not used due to the increased risk of haemorrhagic complications intra- and post-operatively. The patient was put on low molecular weight heparin on the day after surgery.

In order to preserve the closure and reduce compartment tension in the leg and in the area of the repaired artery, it was elected not to close the anterior wound on the leg – in addition a full four compartment fasciotomy through bilateral open incisions was done. Following debridement and soft tissue closure, an external fixator was applied to reduce and align the fractured tibia. Negative pressure VAC dressing was then applied to the open wound anteriorly (See Figure 4). Thus the vascular repair was isolated to an area apart from open wound and negative pressure dressing.

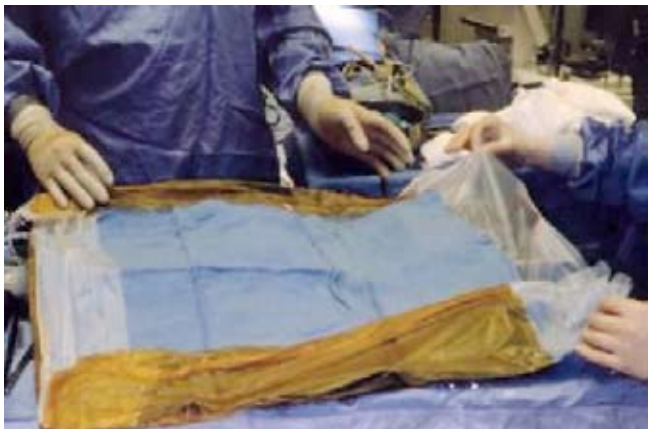

Figure 2B: Opsite Sandwich dressing technique. The skin is dried and shaved – pubic hair shaved as necessary. A surgical drape is placed on Opsite, Steridrape, or Ioban, covering one side only

Figure 3: Bowel bulging under 'sandwich dressing'

WHASA background comments

This case report highlights an interesting dilemma – negative pressure therapy and anti-coagulation. Complications of bleeding in patients on oral anti-coagulants have been reported particularly in infected leg ulcers.[7] Most articles in fact would list anti-coagulation as a relative contra-indication to negative pressure therapy. Logic dictates that preference should be given to ensuring successful outcome of the vascular repair – an alternative wound dressing

Figure 4: Negative pressure dressing leg

(anything from simple hydrogel to foam cavity dressing) could easily have been chosen if bleeding was deemed to be a real risk. Fortunately most surgeons now do not routinely use systemic heparinisation following vascular repair, so the negative pressure dressing should not be too much of a problem.

The timing of arterial repair and exposure of the site are also important. Obviously one would like to carry out the arterial repair as rapidly as possible to diminish ischaemic time, but one has to consider the amount of manipulation and soft tissue exposure that the orthopaedic surgeon would need to fix the fracture. The surgeons would work together on that decision making process, and external fixation of the fracture considerably simplifies the problem.

For both procedures the avoidance of sepsis is paramount to success – thus the dressing chosen would be aimed at promoting granulation tissue and preparing the wound bed for closure (likely skin graft) as soon as possible. In this case this would coincide with the secondary abdominal closure envisaged within the following week. Ideally discussion and planning between surgeons, and possibly the wound therapist involved with the negative pressure dressing, should take place so that the needs of the patient can be orchestrated.

Comments WHASA Wheel partner –
Vascular surgeon: Dr Gregory Weir

Most published articles on the topic of vascular injury stress the importance of reducing the ischaemic time. This will reduce the morbidity and risk of amputation in these patients. In this specific case, the absent/diminished pedal pulses and reduced ankle-brachial pressure index, could have been due to a displaced fracture, which might have caused pressure on the artery. The presence of a thrombosed vessel on the arteriogram confirmed an arterial injury requiring urgent intervention.

Life threatening injuries always require higher priority than limb-threatening injuries. The trauma surgeon and vascular surgeon would probably have explored the abdomen as a team. Only after the life-threatening injury had been controlled, would the limb-threatening injury be addressed.

Due to the fact that the patient was in a supine position for the explorative laparotomy, direct access to the popliteal artery behind the knee joint (usually done through a posterior incision), would have been impractical. A short femoro-popliteal bypass could be used to repair the arterial supply to the distal extremity. Exposure of the distal superficial femoral artery and the second part of the popliteal artery would be required. Autologous saphenous vein is the conduit of choice in bypass surgery distal to the knee joint. The use of the saphenous vein from the contra-lateral limb reduces the risk of venous insufficiency of the ipsilateral limb, especially in the setting of a concomitant venous injury (popliteal vein).

In an effort to conserve time and reduce ischaemia, the vascular surgeon could opt for the use of a temporary vascular shunt between the proximal and distal arteries. This would allow time for the orthopedic surgeon to complete either internal or external fixation of the fracture. While this is being done, the vascular surgeon could harvest and prepare the saphenous vein from the controlateral limb. The bypass can then be performed on a stabilised limb. In extreme cases (damage control), the shunt could remain in position until the patient has been adequately resuscitated.

There should be a low threshold to perform four compartment lower limb fasciotomies through medial and lateral incisions in this patient, due to the patient's increased risk of developing compartment syndrome of his left leg. Post-operative wound care within this setting is of great importance. Various types of dressing, including negative pressure dressings, could be considered. A debridement of the fasciotomies is required within 24 to 48 hours. As soon as the fasciotomy wounds can be closed, either primary closure of the wound or skin grafting can be utilised.

Due to the fact that fasciotomies compromise the normal muscle pump function of the lower extremities, the limb should be elevated in the post-operative period. As soon as the wounds allow, low grade graduated compression bandages and eventually compression hosiery can be applied to prevent venous insufficiency.

Comments WHASA Wheel partner –
Orthopaedic surgeon: Dr Chris McCready

The patient, in this case study, has suffered severe trauma, with multiple injuries. The main role of the orthopaedic surgeon in this case is damage control, regarding the left leg injury. He has sustained a Gustillo-Anderson type IIIc injury to the left tibia. The critical issue that needs to be addressed is the injury to the popliteal artery. The ischaemic time plays a role in deciding if the artery should be repaired first, or if the fracture should be stabilised first. If the fracture is stabilised, the arterial repair is easier, however, the viability of the limb should not be compromised. Another, more commonly used means of fixation is that of an external fixator. This is quickly applied, gives stable fixation, and can be converted to rigid internal fixation once the patient is more stable.

Another consideration, is the open wound. There is a 42% incidence of sepsis with these fractures. A complete surgical debridement should be performed, preferably within 6 hrs of the injury. Due to the high energy transfer involved, the extent of the soft tissue injury is difficult to evaluate. Therefore, it is preferable to leave these wounds open, and should the patients condition allow, perform a second debridement in 72 hrs to remove any remaining necrotic tissue. With exposed bone, or metalwork, an occlusive dressing is preferred. A negative pressure dressing will assist in stimulating granulation tissue, which will provide an excellent bed for a split skin graft at a later stage.

Comments from WHASA Wheel partner –
Trauma surgeon: Prof Ken Boffard

Vascular surgeon is correct and timing is appropriate. Orthopaedic repair should, NEVER in this case be internal fixation, as there would be too much additional disruption of the blood supply and muscle attachments. This case should be externally fixed as described. The vascular repair takes priority over the orthopaedic fixation, but if necessary, a shunt can be used. External fixation is very rapid (10 minutes).

It is mandatory in this case to do a full four compartment fasciotomy through bilateral open incisions which are of adequate length. Almost certainly, the medial one will be in continuity with the vascular incision. In this case, since there is a collateral blood supply, it is reasonable to do the vascular repair first. However, in the absence of pulses with absence of sensation, the fasciotomies should be done *before* the repair. The popliteal vein should be checked since it is often damaged as well. It is critical therefore to preserve the great saphenous vein, as this may be the only viable venous return, and if vein grafting is required, the vein should be harvested from the opposite leg.

The use of the VAC on the open fasciotomies is fine, but may be ineffective in the presence of an external fixator.

I don't believe anticoagulation is an issue here. One does not routinely anticoagulate a vascular repair (especially with the mesenteric ooze, etc). Additionally, we would routinely put this patient on low molecular weight heparin on the day after surgery.

Case report continued

The patient was returned to theatre at 72 hours following the initial procedure. Abdominal compartment pressure had decreased considerably but not sufficiently for full abdominal closure. It was uncertain whether sufficient tissue would be available for full fascial/muscular closure. As a further interim measure VAC negative pressure dressing was applied (Figure 5). The plan was to return the patient to theatre in a further 72 hours – if tissue was deficient for closure additional materials such as vicryl mesh or acellular dermis would be considered for interposition closure.

WHASA background comments

Negative pressure therapy is intended to create an environment that promotes wound healing by secondary intention by preparing the wound bed for closure, reducing oedema, promoting granulation tissue formation and perfusion, and by removing exudate and infectious materials. The concept of leaving the abdomen open intentionally after laparotomy is an accepted method of management in certain circumstances (such as decompressive laparotomy as depicted above). One needs to protect the viscera and allow for a simple return to the abdomen at the time of reoperation. In the past simple skin grafting of the open area was undertaken with the resultant herniation needing secondary repair later (Figure 6).

Utilising negative pressure dressings, current data demonstrate a fascial closure rate of 88%,1 with almost half of these closures occurring at 9 to 21 days after initial operation. Thus the technique allows for the large majority of abdomens to be closed with fewer hernia repairs required. In addition, the technique allows for successful closure at a significant interval after laparotomy.

Basic principles involved are the following:

1. Creating and preserving the peritoneal space between the abdominal viscera and the abdominal wall preventing adhesions and fistulae.
2. The space is usually created with either a temporary prosthetic sheet for early closure, absorbable meshes of varying types or a non-absorbable bioprosthetic material that is non adherent to underlying bowel where it is felt that fascial advancement and closure will not occur. Progressive closure of the peritoneal fascia should be attempted in all cases.
3. Wherever possible early closure (within approximately 9 days of the initial procedure) should be attempted to encourage success and prevent adhesions of abdominal wall and mesh.
4. Negative pressure dressings are used in all the above scenarios as this wound therapy has lead to the egression of bowel oedema, slow advancement of the fascial edges and early closure of the open abdomen.

Various prostheses are available for temporary abdominal closure, including polytetrafluoroethylene patch, polypropylene mesh, and polyglactin mesh. They allow for sequential closure when possible, provide protection to the underlying bowel as well as a method for fluid egress, and it allows for easy abdominal re-entry when necessary.[1-4]

Figure 5: VAC Dressing to the abdomen

The prostheses and negative pressure dressing also address the problems of fascial retraction and adherence of the viscera to the overlying abdominal wall, allowing for continuing attempts at abdominal closure several weeks after laparotomy.

Figure 6: Skin grafting directly on the bowel

Temporary abdominal wall closure techniques in the past have been associated with enterocutaneous fistula produced by erosion of the bowel by overlying dressings. The major barrier has been lack of a prosthetic material that can be put directly on bowel without eroding and can be inserted into a contaminated field. Authors have reported success with aggressive early closure of the open abdomen using a nonabsorbable biological prosthesis made up of with human acellular dermal matrix (Alloderm, Lifecell Corporation, Branchburg, NJ).[1]

In these authors experience most of even the largest defects can easily be closed with just a few sheets because the dermal matrix expands up to 40% of its original size once well hydrated. Successful incorporation of tissue into this prosthesis has been demonstrated.[1]

Comments from WHASA Wheel partner –
Trauma surgeon: Prof Ken Boffard

With regard to the WHASA principles elaborated above:

I. I absolutely agree. The ideal is that the plastic is in contact with bowel, while the swab or drape is in contact with the anterior abdominal wall. This stops it sliding about.

2 & 3. Most times, early closure is critical to avoid sepsis, so I would suggest that 72 hours is optimum.

4. I absolutely agree with VAC as a secondary closure. It should not be used initially, since it can exacerbate an Abdominal Compartment Syndrome due to its rigidity under vacuum.

Case report continued

Seven days later the patient was returned to theatre, the abdomen was successfully closed and the left leg wound was skin grafted. The patient was returned to ICU for ongoing monitoring.

On the eighth day nurses observed an area of redness and inflammation in the sacral region and on the undersurface of the right heel. The sacral pressure sore progressed rapidly to significant skin breakdown. Simultaneously the patient developed a rash on his back.

The sacral pressure sore was diagnosed as a Grade 4 pressure sore (full thickness damage involving underlying muscle) (Figure 7). Hydrocolloid dressings were initially used then hydrogel dressings were introduced to stimulate granulation tissue in preparation for surgery.

Fortunately the heel pressure was diagnosed as Stage 2 (damage to the epidermis and part of the dermis presenting as a blister) (Figure 8). The heel blister was evacuated, hydrocolloid dressings applied and a pressure relieving system was utilised. Due to the patient's background diabetic condition, the resident podiatrist was consulted to manage the patients feet and to educate him on long term care of his feet.

Figure 7: Sacral pressure ulcer

The rash that presented on the patients back was initially a mystery. The rash then progressed rapidly to involve the patient's eyelids and lips. The rash consisted of atypical blistered targets and erythematous macules encompassing bullous lesions of irregular size and shape dispersed over his body progressing to desquamating skin lesions (Figure 9). The dermatologist consulted carried out a detailed analysis and discovered that following on the head injury the patient was being treated with an anti-epileptic drug (lamotrigine) as preventative therapy. Stevens Johnson Syndrome was diagnosed.

Figure 8: Grade 2 heel pressure sore

Figure 9: Desquamating areas on the back – Stevens Johnson Syndrome

Successful resolution of this difficult condition transpired following a treatment regimen that included: oral carbamazepine for epilepsy control, intravenous methylprednisolone initially and decreasing doses over the following 2 weeks, and oral pheniramine maleate. Topical wound care with hydrocortisone acetate cream and polyurethane sheet dressings.

Comments WHASA Wheel partner –
Wound healing specialist: Prof Magda Mulder

The symptomatic treatment in these patients are almost the same as for burns.

The nursing objectives are to:

- Maintain fluid and electrolyte balance
- Prevent wound infection and sepsis
- Promote wound healing
- Control environmental temperature (30 – 32ºC reduces caloric loss through the skin)
- Give psychosocial support

Because skin and mucosa are the body's first line of defence, infection is almost an unavoidable consequence. Scrupulous aseptic technique is essential when any procedure is carried out on the patient. Prophylactic systemic antibiotics are not recommended.

Several approaches in wound management are used:

- Extensive debridement of nonviable epidermis followed by immediate cover with biological dressings or non-adherent dressings that can either absorb excess exudate, add moisture to a dry wound bed or retain moisture to ensure moist wound healing.
- Leaving the involved epidermis that has not yet peeled off in place and cover it with dressings only to protect and absorb and using biological dressings on raw dermis.

Comments WHASA Wheel partner –
Dermatology specialist: Dr Gary Levy

Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) are severe life-threatening forms of skin disease. In about half the cases the cause is not known while in 50 % of cases the use of a drug can usually be identified. The more severe the reaction, the more likely that it was drug-induced. Anticonvulsants, non-steroidal anti-inflammatories and antibiotics especially penicillin and sulpha drugs are the most commonly reported drugs, but more than 100 other medications have been implicated.

SJS and TEN are probably the same condition, the name SJS being applied when less than 10% of the skin surface is involved, TEN when more than 30% of the skin surface is involved, and SJS-TEN overlap when the involvement is 10-30 %. Skin involvement is usually preceded by malaise, fever, cough and a sore throat.

Skin lesions usually begin on the face and trunk and spread rapidly to involve other areas of the body. The initial lesions are macular, and may remain so, followed by desquamation, or may transform into target lesions with purpuric centres, and may even form bullae, which will later slough. Mucosal surfaces are almost always involved: the oral mucosa and the conjunctiva being the most frequently affected. The genitalia, oesophagus and respiratory epithelium can also be involved. Consequently, eating, drinking and urinating can be extremely painful.

The pathogeneses of SJS and TEN have not been fully elucidated. Histology in both conditions shows extensive keratinocyte apoptosis. It is now hypothesised that the apoptosis is caused by the suicidal interaction of Fas which is expressed by keratinocytes and increased amounts of soluble Fas ligand (sFasL) secreted by peripheral blood mononuclear cells (PBMC's).

Management of these patients is similar to those with an extensive burn. Most patients are hospitalised and suspected drugs are immediately stopped. Fluid and electrolyte balance must be maintained via intravenous fluids. Bacteraemia and septicaemia are common complications and can result in death. Appropriate antibiotics are usually given intravenously. The use of intravenous steroids is controversial: in theory the use of immunosuppressives is to prevent further "immune" damage to the skin. Whether there is any benefit remains controversial and certainly once most of the skin is lost, steroids only add to the morbidity and perhaps mortality of the patients.

More recently, reports of high doses of intravenous immunoglobulin (IVIG), administered within the first 4 days of onset of SJS/TEN have shown promising results. It is felt the IVIG blocks the Fas- sFasL interaction and thereby reduces/stops apoptosis. Renal function, which may already be impaired, must be carefully monitored, as there are reports, especially in adults, of deterioration of renal function following IVIG administration. In patients who survive, re-epithelialisation takes 3-4 weeks. Complications include scarring, loss of vision and blindness. Mortality averages 5% for SJS patients and 30% for those with TEN. A rule of thumb is that the mortality rate parallels that of skin involvement i.e. 50% skin involvement will result in a 50 % mortality rate.

Comments WHASA Wheel partner –
Podiatric specialist: Joanne Crawford

This patient appears to have intact sensation; however a thorough medical history and comprehensive clinical examination may reveal subtle signs and symptoms of early peripheral neuropathy. This patient needs education on the foot complications of diabetes and the importance of good metabolic control to prevent or reduce future foot complications.

The immediate podiatric concerns in this situation are the right heel and peripheral oedema. The resolved pressure ulcer of the right heel may require in-shoe cushioning/accommodation now that the patient is ambulatory, to protect the recently healed area from breakdown. Post surgery any peripheral oedema must be assessed, oedema makes footwear difficult and is a major cause of foot ulceration. Wearing roomy shoes, with fastenings that can improve width fitting (such as laces or Velcro fastenings) may be required until the peripheral oedema is resolved. Post surgical compression hose may be required based on the input of the vascular surgeon. Custom footwear may need to be considered in collaboration with the orthotist.

The fracture and reconstruction of the left leg is bound to alter lower limb mechanical function, placing uneven forces on one or both feet which may increase the risk of foot ulceration. This needs to be assessed; and measures taken to normalise foot function with the use of an in-shoe device, such as foot orthoses, and/or shoe modifications.

Case report continued

Following 10 days of aggressive treatment for the dermatologic condition and dressings of the sacral pressure sore and heel sore, the sacral area was clean enough for definitive closure and the heel sore had resolved. Ongoing cleaning and maintenance of the sacral area was extremely difficult due to the proximity to the anal area. Surgeons thus decided to perform a defunctioning colostomy (cognisant of the previous abdominal reconstruction performed).

Once the patient had once again stabilised, he was returned to theatre and the plastic surgeon performed a bilateral V-Y advancement flap for closure of the sacral pressure sore (Figure 10).

The patient still suffered from residual skin hypersensitivity and was treated by the stoma therapist for stomal dermatitis. The cause appeared to be an inadequate seal and leakage of effluent. Once this was corrected overall healing occurred uneventfully.

Figure 10: Grade 4 sacral pressure sore closed with V-Y advancement flap

Comments WHASA Wheel partner –
Wound care specialist: Prof Magda Mulder

It is essential to try and prevent pressure sores in all bedfast patients. (Prevention is better than cure.) An important aspect of the prevention of bedsores is the identification of those who run the risk of developing them. If it appears that a patient does run that risk, adequate precautions in terms of a scientifically based nursing care plan must be implemented from the time of admission.

A number of pressure sore risk assessment instruments are available, e.g. the Norton, Douglas, Waterlow, Gosnell and Braden scales.

Pressure sore risk assessment scales attempt to identify the presence of extrinsic and intrinsic factors that are known to increase an individual's susceptibility to pressure damage, and to quantify the risk with a numerical scale.

Since most patients' conditions do not remain static, pressure sore risk assessment should be seen as a dynamic process. Patients should be reassessed when their conditions alter.

Consequently the precautions must be continuously adapted accordingly.

Comments WHASA Wheel partner –
Stoma therapy specialist: Sr Jane Hoole

Trauma: There are many injuries involving the colon, anus, rectum and perineal area that may require temporary diversion of the faecal stream. The most common of the diversions is the colostomy. The patient will have the stoma until continuity of the distal tract can be restored.

Obstetric injuries, skin grafting of extensive sacral pressure ulceration, extensive anal fistulae are but a few of the indications for diversion of the faecal stream, thus preventing wound contamination in the perineal area.

Figure 11: Loop Colostomy

Figure 12: Loop colostomy 1 day following surgery

Peristomal dermatoses are a significant problem, affecting more than one third of patients with colostomies and more than two thirds of patients with urostomies and ileostomies. The most common cause of peristomal dermatitis is the leakage of effluent due to ill fitting/incorrect use of the various pouching systems and accounts for approximately 22% of all skin problems. Allergy accounts for only 0.6% of skin problems.

There are however, many and varied reasons for the development of peristomal dermatoses besides leakage, example: psoriasis, eczema, allergens and disease.

Figure 13: Second degree burn ileal effluent

Figure 14: Persistent irritation colostomy effluent

Comments WHASA Wheel partner –
Plastic surgery specialist: Prof Widgerow

The V-Y advancement flap is not the workhorse for closure of sacral pressure sores. Closure utilising this technique results in an incision line directly in the area of pressure. This is only acceptable in the above case as the patient is ambulant (at this stage) and the area is sensate. Other choices (such as rotation flaps, gluteal island flaps) would be better in paraplegic patients.

Case report continued

One week following the sacral surgery the patient was transferred to a general ward and began his process toward recovery. He was now ambulatory, metabolically stable and recovery transpired uneventfully from here. Two months following this severe injury, multiple surgeries and concomitant complications the patient was discharged from hospital. His holistic management involved 11 different specialists working in tandem.

Tow years following this episode, the patient presented to the wound care clinic with a non-healing ulcer of the left leg (Fig 15). Armed with a history of significant trauma to the leg, an ankle -brachial index of greater than 0.8 and the typical appearance of the wound, the wound care sister diagnosed a venous ulcer . The vascular surgeon was informed and treatment was instituted with hydrogels, foams and most importantly compression bandages to the area. Healing was accomplished over the following six weeks and the patient received training in long term maintenance (stockings, diet, hygiene, exercise, etc) of this condition.

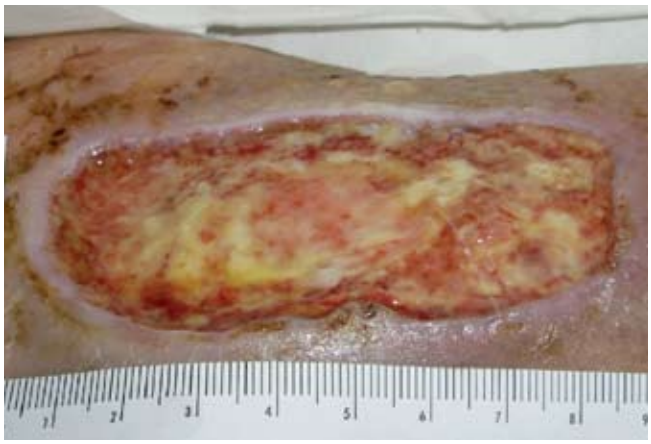

Figure 15: Venous Ulcer

Comments WHASA Wheel partner –
Wound healing specialist: Prof Magda Mulder

As the patient is diabetic, infection due to abnormal cellular and/or inflammatory responses is always a great risk. In view of this a bone scan must always be taken first to exclude osteomyelitis before compression bandages are applied.

Secondly, ankle-brachial pressure index values are not very reliable in diabetics. An ABPI of 0.8 can therefore be misleading due to arteriosclerosis because the hardened arterial walls are not effectively occluded by the cuff. Transcutaneous oximetry ($TcPO_2$) would therefore be a better option. A $TcPO_2$ of less than 40 mmHg at a temperature of 44ºC on the dorsum of the foot indicates tissue vulnerability, while a value of 10 mmHg indicates critical limb ischaemia.

Should it appear that the arterial supply is adequate and that the application of compression would be safe, the patient must be carefully assessed beforehand for peripheral neuropathy. The application of compression bandages in the presence of peripheral neuropathy can be risky as the patient will be unaware of symptoms such as a local burning pain that could indicate possible underlying tissue damage.

If compression bandages are applied, the patient should preferably also wear a sandal with Velcro straps on the foot of the affected leg. A half-stocking must be pulled over the toes to protect them against trauma and to prevent small particles such as pebbles from landing between the sole of the foot and the bandages.

After the ulcer has healed, compression bandages must be applied for a further two to three weeks as premature degradation of collagen may occur in diabetics.

In conclusion

Wound healing forms the basis of medicine in all its forms. It is noteworthy that the speciality has found its own unique position in medicine today as the incorporation of basic science, general medicine and surgery in all its forms all contribute to furthering the knowledge and advancement of this field. The above case illustrates the co-operative ideal of multi-specialist input in managing a patient with multiple problems and one common goal – achieving wound healing efficiently and effectively. Herein lies the WHASA wheel of co-operation.

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Figure 16: WHASA Wheel