Decubitus Ulcers
Management and Surgical Intervention

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Department of Surgery Grand Rounds
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Case Presentation

- 67 YOF who initially presented with epigastric pain for 1 day duration. Found to have NSTEMI on admission.
  - PMH: ESRD, Stage 4 Multiple Myeloma
  - PSH: Right femur repair ~ 1 month before admission (pathologic fx)
- CT Scan showed fecalization of bowel to the distal ileum with ascites
- HD # 2: increasing severe abdominal pain -> General surgery consultation
  - CXR neg for free air
  - Concern for mesenteric ischemia
  - Taken to OR for Exlap - Found to have internal hernia with 60cm of strangulated bowel. Abdomen left open. Transferred to SICU
Case Presentation – Contd.

• POD 2: Found to have persistent small bowel ischemia – Further resection of Small bowel and end ileostomy creation

• POD 5: Further necrosis of terminal ileum, taken for exlap-revision of ostomy.

• POD 5-15:
  • Course complicated by VRE bacteremia, sepsis, significant pressor requirements, hypocoagubility, stomal bleeding, significant blood transfusion requirement, ventilator dependence, and development of intraabdominal abscess.

• POD 15: Pt found to have large 9x12 cm unstageable sacral decubitus ulcer. Thought to be infected. S/p sharp excisional debridement

• POD 15 – Evening: Significant post debridement bleeding noted which was controlled at bedside with surgicell and hemostatic stitch

• POD 15-20 – Increasing intraabdominal sepsis with development of newly resistant VRE bacteremia.

• POD 20: Decision made by family to withdraw further care. Pt ultimately expired that evening.
Outline

• Introduction
• Pathophysiology + Staging
• Financial implications and Impact on quality of life
• Non-Surgical management
• Surgical management
• Current discussions in management
Introduction

• Definitions:
  • Skin breakdown developing secondary to prolonged pressure or pressure in combination with shear friction and other associated factors

• Incidence:
  • 2.7-9% in acute care setting vs 2.4-23% in LTAC facilities
  • 60,000 mortality/yearly
  • Spinal cord injuries:
    • 25% within 1 year
    • 85% lifetime incidence

• Risk factors:
  • Immobility
  • AMS
  • Chronic conditions and malnutrition
  • Race
Introduction

• Symptoms:
  • Pain, infection, chronic disability
• Psychosocial consequences:
  • Loss of control of ADL
  • Depression
  • Stigmatization leading to social isolation and decrements in health related quality of life.
• Cost:
  • $9.1-$11.6B/Year with addition of $43,180 to each hospital stay
• Deficit Reduction Act of 2005, section 5001(c)
  • Identification of high cost or high volume conditions
• By October 2008, Hospital would no longer receive payment for preventable conditions – Such as Stage III-IV Pressure ulcers from CMS
Pathophysiology and Staging

- **Pressure:**
  - Animal modes:
  - > 32mmHg prevents O2/Nutrient delivery
  - Muscle > Subcutaneous fat > Dermis
  - Irreversible damage at 70mmHG > 2 hours

- **Additive Effect:**
  - Mechanical:
    - Shearing forces
    - Friction
    - Moisture
    - Muscle spasm
  - Malnutrition
  - Vascular:
    - Arteriosclerotic disease
    - Diabetes
    - Hypoperfusion
    - Anemia
Hospital-acquired pressure ulcers: results from the national Medicare Patient Safety Monitoring System study.

Lyder et al. J Am Geriatric Society

• Retrospective review of 51,842 randomly selected Medicare admission Jan 2006 – Dec 2007

• PU presented: 2.81 OR of mortality and 1.3% readmission and ~ 7 days longer LOS (p< 0.05)

Table 2. Hierarchical Generalized Linear Model Association Between Participant Characteristics and Pressure Ulcer Development

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Odds Ratio (95% Confidence Interval)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (reference ≥ 85)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;65</td>
<td>0.82 (0.79–0.84)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>65–74</td>
<td>0.82 (0.8–0.84)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>75–84</td>
<td>0.89 (0.87–0.91)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Female</td>
<td>0.99 (0.97–1.01)</td>
<td>.37</td>
</tr>
<tr>
<td>White</td>
<td>1.01 (0.98–1.03)</td>
<td>.56</td>
</tr>
<tr>
<td>Cancer</td>
<td>1.07 (1.05–1.09)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>1.11 (1.09–1.13)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>1.05 (1.02–1.07)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>1.11 (1.09–1.13)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.07 (1.05–1.09)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>1.03 (1.00–1.07)</td>
<td>.04</td>
</tr>
<tr>
<td>Obese</td>
<td>1.04 (1.01–1.07)</td>
<td>.002</td>
</tr>
<tr>
<td>Smoking</td>
<td>1.00 (0.98–1.03)</td>
<td>.80</td>
</tr>
</tbody>
</table>

Table 3. Association Between Hospital Outcomes and Pressure Ulcer (PU) Development

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Total</th>
<th>With PUs</th>
<th>Without PUs</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within 30-days after discharge</td>
<td>2,551 (4.0)</td>
<td>353 (15.3)</td>
<td>2,198 (4.4)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>In hospital</td>
<td>1,892 (3.6)</td>
<td>258 (11.1)</td>
<td>1,634 (3.3)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Readmission within 30 days after discharge, n (%)</td>
<td>9,235 (17.8)</td>
<td>523 (22.6)</td>
<td>8,712 (17.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Length of stay, days, mean ± standard deviation</td>
<td>5.2 ± 5.7</td>
<td>11.6 ± 10.0</td>
<td>4.9 ± 5.3</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
Initial Ulcer Evaluation

- Initial staging of ulcer + Anatomic location
  - Type of ulcer
  - Size of the Ulcer L*W*D
  - Evaluation for multiple ulcers or communicating ulcers
  - Presence of granulation tissue
  - Sensate vs insensate wounds

- Evaluation for infection
  - Cellulitis
  - Odor
  - Necrosis
  - Crepitus
  - Undermining

- Determination of predisposing risk factors
- Basic laboratory testing - Determination of coagulopathy
- Physical capacity evaluation
- Serial Imaging
- Cultures
  - Often swab initially to determine colonization
  - Colonization of $10^5$ will limit wound healing

- Imaging
  - Xray vs CT vs MRI

- Next Step in management?
Non-Surgical Management

• Encompasses both preventative measures and effective therapies used to treat pressure ulcers.
• Often reserved for Stage I-II ulcers
• Systematic review of treatment options showed the following to improve patient outcomes
  • Air-fluidized beds
  • Protein supplementation
  • Radiating heat dressings
  • Electrical stimulation

Support Surfaces

- Multiple studies compared alternating pressure surfaces, air-fluidized beds, and standard foam mattress.
  - Wound improvement was seen in patients who used air-fluidized beds
  - 664 patients
  - Compared 3 groups
  - Results:
    - 5.2cm² vs 1.5-1.8cm² (p<.05) – Wound healing per week
    - ER visits: 7.3% vs 10.2% and 19% (p<.05)
  - Evidence old, generally small sample size and underpowered
  - Moderate level quality

Ochs RF, Horn SD, van Rijswijk L, Pietsch C, Smout RJ. Comparison of air-fluidized therapy with other support surfaces used to treat pressure ulcers in nursing home residents. Ostomy Wound Manage. 2005;51:38-68.
Nutrition

• Multiple studies evaluated use of varying formulations for pressure ulcer wound healing

• Protein found to be overall beneficial for improved healing, however never for complete healing alone
  • No studies were conclusive in the type or mode of protein delivery

• Vitamin C:
  • Good quality evidence showing no benefits to wound healing

• Zinc supplementation:
  • Insufficient evidence to draw conclusions

• No significant benefit to higher dosing of arginine based formulas
Disease-Specific, Versus Standard, Nutritional Support for the Treatment of Pressure Ulcers in Institutionalized Older Adults: A Randomized Controlled Trial

Cereda et al. JAGS 2009

- Randomized trail of 28 patients
  - 15 receiving standard nutrition (16% calories from protein)
  - 13 receiving enriched (20% with zinc, vitamin C, arginine supplementation)

- Outcomes:
  - Ulcer healing using the Pressure Ulcer Scale for Healing (PUSH)

- Results:
  - Significantly improved outcomes in wound healing rate at 8 and 12 weeks in treatment group
  - Significantly improved PUSH score by week 12
Local Wound Applications

- Overall there is no significant difference in complete wound healing when comparing types of local wound applications
  - Systematic review of 89 original studies reviewing 7,115 patients
- Hydrocolloid gauze dressing
- Radiant heat dressings
- Phenytoin dressings
- Debriding enzyme agents

Used, Yet Unproven Treatments

• Addition of:
  • Vitamin E
  • Anabolic steroids
  • Baclofen, Dantrolene, Cannabis – Antispasmodic agents
  • Electrical Stimulation
  • Electromagnetic Therapy
  • Therapeutic US
  • Negative Pressure wound therapy
  • Hydrotherapy
  • Light Therapy
  • Laser therapy
Surgical Management

• There are no clear criteria for selecting patients to undergo surgical closure, however there are guidelines.

• Generally surgery is reserved for:
  • Stage III-IV
  • Pressure ulcers extending into bone or joints or those causing osteomyelitis
  • Complications from open wounds
  • Acute ulcer development in otherwise healthy patients
  • Ulcers which limit quality of life

Surgical Treatment of Pressure Ulcers.
Direct Closure and Skin Grafts

- Direct closure:
  - Rarely ever indicated
  - High rate of recurrence and dehiscence

- Skin flaps
  - Reserved for well granulated wounds
  - Requires pressure offloading for 3 weeks
  - Split vs full thickness grafts
Plastic Surgery - Skin Flaps

• Categorized based on type of vascular supply or type of tissue in flap.
  • Cutaneous Flap
  • Fasciocutaneous flaps
  • Myocutaneous flaps
  • Muscle flaps

• Type of flap transfer:
  • Rotational flap
  • Advancement flap
  • Transportion flap
  • Regional Flap
  • Free Flap

Fig. 7.1 Type of geometrical movement of flap, (a, b) rotation, (c, d) advancement, and (e, f) transposition
Flap Management of Sacral Pressure Ulcer

- Gluteus Maximus muscle most commonly used for repair
- Recommended for non-ambulatory patients
  - Detachment of gluteus muscle leads to functional impairment
- Dual blood supply
  - Superior and inferior gluteal artery and the medial circumflex
- Originates from lumbar fascia and inserts into the greater trochanter.
  - External rotation and extension of hip joint
- Rotation flap, Advancement island flap and splitting transposition flaps.

Fig. 9.5 Complete rotation of the gluteus maximus flap to cover the defect

Fig. 9.6 Sutured flap in place

Fig. 9.7 Operative photograph showing excision of the ulcer and dissection of bilateral gluteal flap

Fig. 9.12 Operative photograph showing the dissected bilateral gluteal flap with the transposition of the flaps, one flap to cover the ulcer and the other flap to cover the rest of the defect
Advancement Flaps

**Fig. 9.17** Operative photograph showing the excision of the ulcer, shaving of the bone, and dissection of the island flap.

**Fig. 9.19** Operative photograph showing the complete dissection of the island laterally and the advancement of the island to cover the defect.

**Fig. 9.18** Operative photograph close-up view showing the shaving of the coccygeal bone. Arrow indicates the location of the bone.

**Fig. 9.20** Operative photograph showing complete closure of the flap.
Post Operative Care and Complications

• Post Op Care:
  • Focus on relieving pressure, Antibiotics and supplementary measures for wound healing

• Infection
  • Very common
  • Bacterial contamination
  • Colostomy

• Vascular compromise
  • Tension
  • Previous surgery

• Muscle Spasm:
  • Can lead to shearing force development

• Development of seroma/Hematoma
• Flap necrosis
Long-Term Outcome of Pressure Sores Treated with Flap Coverage

• Review of Non-randomized 45 ischial and 24 sacral pressure ulcer patients from 1990 to 1995
• Analyzed types of flap used
  • Sacrum: 23 patients underwent Fasciocutaneous flap, 1 myocutaneous
  • Ischium: 18 patients underwent fasciocutaneous flaps and 30 myocutaneous flaps.
• Outcomes: %PSFS
• Results: 49% overall in Fasciocutaneous vs 63% in myocutaneous flaps.
A systematic review of complication and recurrence rates of musculocutaneous, fasciocutaneous, and perforator-based flaps for treatment of pressure sores.

Sameem M et al. Plast Recon Surg 2002

• Inclusion criteria:
  • Examination of myocutaneous, fasciocutaneous, and/or perforator based flaps
  • Examination of pressure sores: Sacrum, Ischium, trochanteric regions

• Outcome measures:
  • Overall complications
  • Recurrence rates

• Results:
  • 55/894 articles reviewed
    • 28 evaluating myocutaneous flaps – Overall recurrence rate of 8.9%
    • 13 evaluating fasciocutaneous flaps – Overall recurrence rate of 11.2%
    • 14 evaluating perforator flaps – Overall recurrence rate of 5.6%
    • No statistical difference overall in complications/recurrence rates
Complications of Myocutaneous flaps

Complications of Fasciocutaneous flaps

Complications of Perforator flaps
Final Thoughts

- Pressure ulcers are expensive complications which are preventable with appropriate care.
- All ulcers need to be staged for appropriate management.
- Treatment of pressure ulcers is MULTIFACTORIAL and requires both surgical and non-surgical options.
- If you feel uncomfortable with wound debridement: Please ASK your senior residents to supervise you.

www.downstatesurgery.org
Thank You

Nurstoons by Carl Elbing

WHY IS IT MY FAULT HE GOT A BED SORE?! 

HE'S A ZOMBIE!! HE DOESN'T HAVE ANY CIRCULATION TO HIS SKIN!! HE DOESN'T HAVE ANY CIRCULATION!!

HE DIDN'T HAVE A PRESSURE ULCER ON ADMISSION

SHE'S MAKING MY HAIR FALL OUT TOO

www.nurstoontoon.com