Presented at the 23rd Annual Meeting of the Wound Healing Society; SAWC Spring/WHS Joint Meeting: Denver, Colorado • May 1 - 5, 2013

Limited Mobility and the Foot:

Plantar Flexion Contractures, Heel and Malleoli Pressure Ulcers, Peroneal Nerve Damage – How Can We Prevent Them? What Happens If We Don't?

A Literature Review

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ABSTRACT

Limited Mobility and the Foot: Plantar Flexion Contractures, Heel and Malleoli Pressure Ulcers, Peroneal Nerve Damage – How Can We Prevent Them? What Happens If We Don't?

A Literature Review.

As wound management clinicians we are well aware of the risk of heel pressure ulcers (PUs) in the bed-bound patient with limited mobility. A heel ulcer is the one PU that can be prevented with complete pressure relief. If the hips are allowed to rest in external rotation, the lateral and medial malleoli at the ankles, and also the lateral areas of the knees are at risk. With sustained pressure in the lateral knee area, there is the possibility of damage to the peroneal nerve which can result in motor and sensory loss to the lower leg. One of the most severe problems of immobility is a plantar flexion contracture (commonly known as foot drop), due to shortening of the Achilles tendon, as the foot is allowed to fall and remain in plantar flexion. The resultant decrease in range of motion (ROM) of the ankle impairs gait, increasing the risk of falls.

All of the sequellae of bed-bound, limited lower extremity mobility patients contribute to increased length of stay in the hospital, staff time, and resources. PUs increase the risk of infection, require expert management to avoid surgery and/or amputation, and delay gait training and increase of mobility and quality of life. Interventions require education for and cooperation by the patient, family, care givers, and staff. There are guidelines, devices, and nursing and physical therapy interventions that assist in preventing problems, reducing hospital length of stay, and avoiding re-admissions.

A literature search was performed to identify direct complications that arise from plantar flexion contractures. Except for indirect issues as PUs, falls, and potential complications from surgery, there were with minimal results in peer-reviewed literature. Many articles are available discussing prevention and control. Best practice remains prevention of heel/foot PUs and plantar flexion contractures.

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LITERATURE REVIEW

Research Questions:

A literature review was conducted to answer the following research questions:

- What is the prevalence of foot drop, and what complications arise from foot drop?
- What can be learned regarding foot drop based on the current literature?
- What recommendations exist within the peer-reviewed literature for reducing the likelihood of foot drop?

Key Words:

Index Medicus was searched and the following key words were utilized in various combinations:

- Foot drop
- Plantar flexion contracture
- Peroneal nerve injury
- Bed rest complications associated with foot drop

Summary:

Due to a dearth of literature, the review included references older than 5 years. Plantar-flexion contractures (foot drop) can develop as the result of any condition that leads to immobilization.[1] Foot drop places patients at increased risk for pressure and friction-related injury which can lead to complications from pressure ulcers,[2] and can have a major impact on patient outcomes and ability to perform activities of daily living. Activities such as walking,[3] walking up stairs,[4] and rising from a chair[5] can be impacted without adequate range of motion in dorsiflexion.[6] The patient's gait pattern can also change as a result of decreased hip extension and resultant knee hyperextension,[7] which can negatively impact patient transfers and lead to accidental patient falls. After reviewing the literature in PUBMED, non-peer reviewed sources were also reviewed. It is prudent to say additional complications that might be associated with foot drop are those related to surgical treatment of any condition, such as infection, complications with anesthesia, etc.

Prevention

The incidence of hospital-acquired pressure ulcers (HAPU) were compared before and after the QI initiative, by comparing the number and stage of HAPUs from baseline to 1-year intervention, and from baseline to 1-year post-intervention. Economic metrics were also compared before and after the intervention by comparing the cost of bed rentals from baseline to 1-year intervention, and from baseline to 1-year post-intervention.

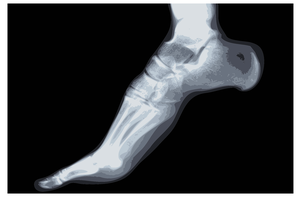
- Cuddigan et al[2] recommended patients be treated with a heel-suspending device after a minimum of 6 hours of immobility and within 24 hours of immobility to prevent plantar-flexion contractures.

- Meyers[9] published an article that discusses prevention in the critical care population. During a clinical study, patients were provided a heel offloading intervention compared with standard of care prevention using pillows. The study revealed patients who received the intervention did not develop hospital acquired pressure ulcers or foot drop, and 50% of abnormal heels showed improvement. The standard of care group experienced foot drop and hospital acquired pressure ulcers.

CLINICAL IMPLICATIONS FOR PREVENTION

(EXPERT OPINION BASED ON EXPERIENCE AND REVIEW)

Prevention of facility-acquired pressure ulcers, plantar flexion contractures, and peroneal nerve compression is important. In order to do this, we must address calf compression, decreased circulation, hip external rotation, friction, shear, malnutrition, dehydration, moisture, positioning, exercise and early ambulation. Risk assessments and guidelines are available for pressure ulcer prevention, which include many of these issues. Heel pressure ulcers and plantar flexion contracture risk can be decreased with a heel-offloading device, although use of such a device is contraindicated with existing fixed plantar flexion contractures and spasticity.



Overall prevention includes the following interventions:

- Exercises for ankle range of motion (ROM) should be conducted twice daily.
- Early ambulation with feet flat is important for all patients.
- Ankle foot orthoses (AFOs) should not be used in bed – they are for gait only, and when in use, the heel and Achilles areas should be closely monitored.
- Physical Therapy should address stretching, strengthening, gait training with manual therapy, electrical stimulation, serial casting , etc., as appropriate.
- A pressure redistribution surface with a heel zone with decreased pressure
- To prevent heel and malleoli pressure ulcers, a pillow under the lower leg with heel suspended is suitable for short term, < 6 hours. Beyond 6 hours, a removable heel off-loading device is needed.
- Protective barriers or foam dressings have been shown to decrease friction and shear, but do not prevent pressure
- Heel offloading devices should include the following attributes in order to avoid harm:
  - Heel is visible when the device is in place
  - No pressure on the Achilles tendon
  - Washable for infection prevention issues
  - Breathe and wick away moisture
  - Ability to accommodate sequential compression devices, negative pressure wound therapy, tubing, traction and other essential devices
  - Stays in place on the extremity with patient movement
  - Has straps that do not damage skin and are loosely applied to avoid pressure on dorsum and lateral edge of foot and the lower leg
  - A device with an anti-rotation wedge assists in maintaining neutral position of the lower extremity in order to prevent hip external rotation and subsequent lateral knee and/or malleoli pressure ulcers and/or peroneal nerve compression

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Poster supported by an unrestricted grant from Sage® Products Inc.