

# FOUR YEARS' EXPERIENCE OF EFFECTIVELY TREATING COMPARTMENT SYNDROME BY COMBINING NPWT WITH A POLYMERIC MEMBRANE INTERFACE LAYER



Geert Vanwalleghem CNS, Wound Care and Pressure Ulcer prevention  
H. -Hartziekenhuis Roeselare-Menens vzw, Belgium

## INTRODUCTION

Compartment syndrome is a painful condition leading to dangerous build-up of pressure within the muscles causing decreased blood flow and tissue necrosis. Acute compartment syndrome is a medical emergency requiring immediate surgical treatment with a fasciotomy, in order to relieve the excess pressure. At our hospital we often combine fasciotomy with negative pressure wound therapy (NPWT) by using a vacuum suction device placed over the open wounds to encourage rapid reduction of swelling. The average time for NPWT treatment is two weeks. Dressing changes were often performed in the operating theater as they are painful and time-consuming due to ingrowth of granulation tissue into the foam used with the suction device. Tissue ingrowth also leads to excessive bleeding during the dressing changes. The fasciotomy incision sites are usually ultimately closed using skin grafts, which is both painful and often not desirable from a cosmetic perspective.

## Aim

To reduce costs and improve patients' outcomes including:

- Reduce required frequency of anesthetizing the patients;
- Reduce operating theater time and associated costs;
- Reduce the need for pre-dressing change pain medication;
- Reduce the amount of bleeding associated with dressing changes.

## METHOD

Polymeric membrane dressings\* (PMDs) were placed as an interface layer prior to NPWT after the fasciotomy. Dressing changes, without pre-medication for pain management, were performed twice a week at the patients' bedside. Once the swelling was reduced, the wound bed clean and granulating and the skin naturally approximated, the NPWT was discontinued and either a skin graft was performed or PMDs were continued to closure.

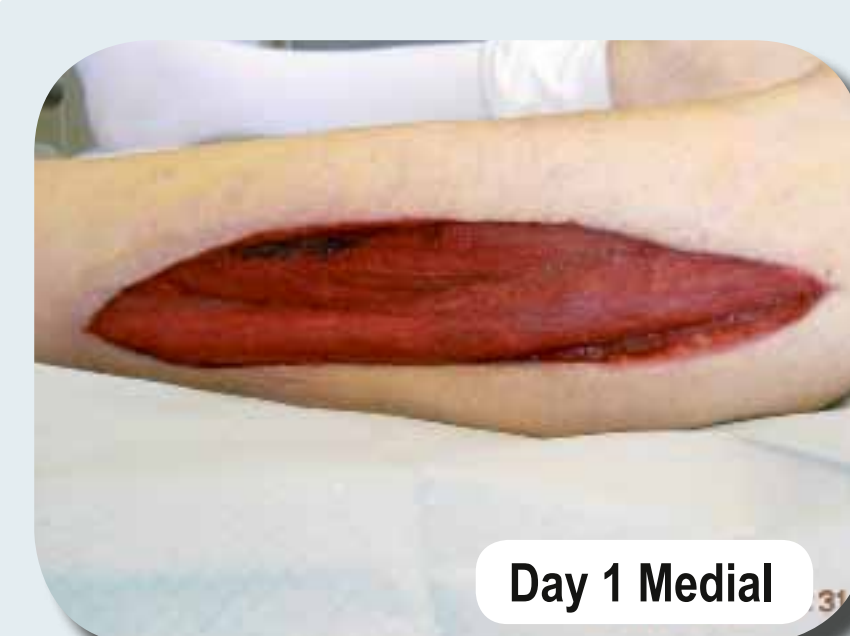
## RESULTS

During the past four years we have treated 15 patients with limb-threatening, compartment syndrome cases using this method. With PMDs as an interface layer, there was no ingrowth of granulation tissue or any risk of the dressing sticking to the granulation tissue. As a result none of the patients needed to be sedated or have their changes performed in the operating theater. After 4 or 5 dressing changes, NPWT was usually discontinued. The wounds treated with PMDs all the way to closure had a better cosmetic appearance than those that were skin grafted. The results detailed here are consistent with what is known about PMDs. The dressings are specifically designed to not stick to an open wound, and to help reduce both procedural and chronic wound pain. PMDs have been shown to reduce the amount of swelling in tissues when applied in contact with both open wounds and the skin over injuries.



### Fasciotomy of the arm of an elderly man due to fall at home.

In cases where much of the muscle is exposed we always had problems with ingrowth of tissue combined with heavy bleeding. By using PMDs as an interface layer we eliminated these problems and changes could be performed at the patient's bedside. Day 20 we stopped the NPWT and continued with PMDs until full closure giving the patient a cosmetically pleasing scar.



### Fasciotomy on both sides of the lower leg due to complications after thrombectomy.

The combination of PMDs as an interface layer together with NPWT facilitated very fast reduction of oedema and rapid granulation tissue formation. No bleeding at dressing changes which were done at the patient's bedside without any need of anesthetics. The surgeon opted for skin grafts due to the extent of tissue loss on both sides of the leg. Fast closure was critical in order to avoid future complications.



### Fasciotomy of the leg due to compartment syndrome.

The leg was critically ischaemic and started to become oedematous. There was also a great deal necrotic tissue which is a contraindication to NPWT so we initially treated with only PMDs until necrotomy had been performed.

After the first applications of NPWT we detected new necrotic tissue in the deeper layers so debridement was required until the tissue became clean.

When debridement was no longer needed we could do the dressing changes at the patient's bedside thanks to the PMD interface layer.

It took longer than usual for the granulation tissue to fill up the defect due to the extent of the wound. Four days later a skin graft was performed.

The graft has taken nicely but as you can see there will be a prominent scar over this large area. PMDs are used to cover the graft.

## DISCUSSION

Prior to using PMDs as an interface layer, most dressing changes were performed in the operating theater under full anesthesia due to painful ingrowth of granulation tissue into the NPWT foam. By using PMDs as interface layers this never happened.

We have not calculated the exact cost savings but it is obvious that there have been huge savings not only for the hospital but also for the insurance companies involved in spite of the additional cost of the PMD interface layer. In the past we tried using several other wound contact layers with various success; some slipped out of place and others stuck to the tissue. With PMDs we experience no sticking and the structure of the granulation tissue seems cleaner.

In addition to the reduced costs associated with changing the dressings at the bed-side, there are additional cost savings this approach delivered: fewer skin grafts, quicker discharge, elimination of emergency scheduling of the operating theater in order to perform unplanned NPWT dressing changes; Most importantly, health care is about patient outcomes. When PMDs were used, the patients had improved clinical and cosmetic outcomes. One of those key improved outcomes was reduced pain. It is well accepted that reducing pain, especially without the need for pain medication, improves patient healing.

## Bibliography

Beitz AJ, Newman A, Kahn AR, Ruggles T, Eikmeier L. A polymeric membrane dressing with antinociceptive properties: analysis with a rodent model of stab wound secondary hyperalgesia. J Pain. 2004 Feb;5(1):38-47.