



POOR MAN'S VAC© REVISITED – AIR LEAKS IN NEGATIVE PRESSURE WOUND MANAGEMENT

Surgery

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ABSTRACT

Vacuum assisted closure has reformed the plastic surgery practice and wound management in the last decade and has become an established method of wound management. The equipment though not inexpensive has become an essential part of all major plastic surgery departments in the western world. In ideal world VAC Dressing equipment should be available at hand at all times but the shortage of equipment in developed countries or even unavailability in developing world is a common phenomenon.

Due to which a lot of new methods are being tried to make vac dressing cheaper and easily available in developing countries. But with new techniques come new flaws and a need to study and rectify those flaws. Our study aims to study the effect of air leak in patients with Vac Dressing using Wall Mounted negative suction. We conducted the study on 34 patients to find out the effect of Air leak in Negative Pressure Wound Management

AIM OF THE STUDY-

To find out the effect of presence of a leak in Vacuum Assisted Closure Devices.

KEYWORDS

Negative Pressure Wound Healing, vac Dressing, air Leak, wound Management

INTRODUCTION:

Vacuum assisted closure in open wounds is now a universally accepted technique in the management of open wounds. Since initial investigation of techniques by Morykwas^{1,2,3,4} in 1997 there has been great strides in the design and marketing of the portable VAC system developed by KC I industries. However, the cost and availability still restrict the use of this fantastic device the developing world, leading to experimentations with indigenous vacuum assisted devices in the wound healing. There have been various kinds of devices reported in surgical journals starting from simple negative pressure vacuum dressings to wall mounted suctions to pressure control devices. Studies ranging from the cost effectiveness of these devices, to efficacy and various modifications suggest the wider applications of home-made / customised negative suction dressings is becoming more prevalent.^{5,6,7,8,9,10,11,12,13} Various modifications have been reported to try and prevent the incidence of a leak in these devices which effectively leads to a loss of negative suction.

Our study aims to determine the effect of air leaks in clinical settings on 34 patients having total of 148 dressing

METHODS:

We applied negative suction sponge dressing to wounds which would have been difficult to manage by conventional dressing and where standard VAC equipment use was not indicated.

MATERIALS:

- Sponge Foam (to be sterilized before use)
- Romo vac or Similar 18 Fr drain
- Opsite or similar material
- Gelonet/Bactigras/or Similar dressing Material

Inclusion Criteria

- Acute and chronic wounds needing negative pressure dressings
- Wounds with minimum 2-inch gap in approximation to easily identify bed conditions

Exclusion Criteria

- Diabetics
- Wounds with maggots
- Suspected sinus or osteomyelitis.
- Open fractures.
- We recorded the progress of the wound on a modified push tool based on the total surface area amount of exudate from the wounds when the tissue type on the bed.

MODIFIED PUSH SCORE

Parameters	1	2	3	4
Size	Decreased	Same	Increased	
Exudate amount and type	None	Light serous	Moderate serous Or pus	Heavy serous
Wound bed	Healthy	Unhealthy granulation	Slough / pus	Necrosis

- Great attention was paid at every dressing to see whether wound characteristics were improving and whether the wound was shrinking in size.
- Records were kept on a standard sheet to be analysed.

Dressing application was using a standard room-vac suction drain the drain was tunnelled out of this skin and t-tailing method¹⁴ was also used Standard precautions before the application of VAC were taken in all cases, all necrotic tissue eschar slough and Debris was surgically debrided under anaesthesia before the application of the negative pressure dressing. An intermediary dressing of non-adhesive paraffin gauze was used, as an interface between wound and sponge in all cases, it is found to be very helpful in reducing pain while dressing is changed.

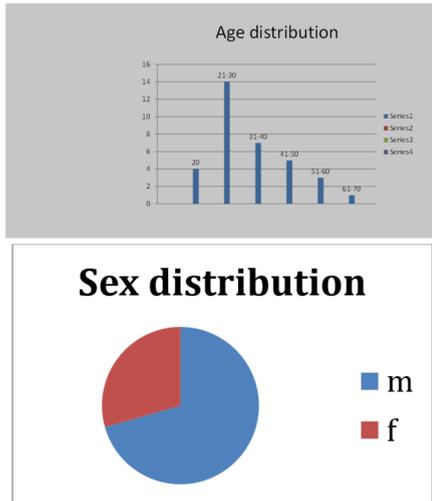
Sponge Sterilization			
Sponge foam used is procured from hardware stores and autoclaved twice at			
Autoclave Settings	Temperature (F)	Pressure (PSI)	Time (min)
	250	20	30
The sponge foams were initially sterilized at these settings and sectioned and sent for microbiological examination and found to be sterile and the protocol has been established since then.			

RESULTS:

- Study included total of 34 patients with 148 dressing applications average 4.35 changes per patient. Leak occurred in 20 dressings with all but 1 out of these having unfavourable push score. There were 3 negative push scores in patients without leak.

	Favourable score	Unfavourable score	total
Without leak	125	3	128
leak	1	19	20

- It was clear during the first 8 leaks that results were disastrous. And modification was made by connecting the leak dressing to continuous low-pressure wall suction but even this change did not make any difference.
- The incidence of leak in our study was 13.5%
- Statistically the p value was less than .0001



DISCUSSION:

VAC is a very effective method of wound management. Standard devices come with a lot of safety measures and have standard alarm for air leaks. Indigenously designed negative pressure dressings are becoming increasingly common and lot of researchers are adding new ideas and refinement. Generally lower pressure causes less pain and discomfort and in our limited opinion is more acceptable to patients and equally effective. The wide range suggested in various studies may also negate the need for strict control of pressure.

Siddha et al⁷ & S Ram et al¹⁴ beautifully investigated and compared pressure created by various devices while investigating the efficacy of improvised negative pressure dressings and reported the pressures created with 50 cc plastic syringe on maximum retraction is 0.06 Mpa = 450 mm Hg pressure, (b) negative pressure created at keeping at level of 30 cc retraction is 0.04 Mpa = 300 mm Hg pressure, (c) negative pressure created at keeping at level of 20 cc retraction is 0.03 Mpa = 225 mm Hg pressure

Negative pressure created with romo-vac suction on full compression is 0.02 Mpa = 150 mm Hg, (b) negative pressure created with mucus sucker is 0.01 Mpa = 75 Sc.

Negative pressure the devices that have been used indigenously depend on some form of dressing to prevent the air from getting through the side of the wound of home or in some cases standard surgical mop connected to a pressure device which creates and maintains the negative pressure on the wound.

In our study we found that air leak in the negative pressure dressing is always almost detrimental to the wound healing process even if a continuous suction is maintained or there may be some amount of loss of pressure with some devices it makes no difference to the wound healing and the leaks should be dealt with as soon as possible.

It was not surprising to note that in early investigating modules Morykwias MJ2. Also found the same results in animal models where he in one of his studies simulated air leaks by cutting a hole in the vacuum seal and he also concluded that the presence of leak may actually lead to increase in size of the wound. It is interesting to note

that in his study the wounds were artificially created relatively clean ones in a pig model. In our study all the wounds were already infected or necrotic by the time the treatment was initiated. In early part of the study (initial 8 leaks) room-vac negative suction had been used and recharged intermittently when fully expanded in this model all leaks showed unfavourable changes in wound and push scores were reflective of the same. But, at the later half a continuous suction pressure was used which theoretically should suck out all the debris and exudates from the wound continuously and maintain negative force on wound bed, but in presence of an air leak it is also ineffective. During dressing changes a lot of unhealthy exudate sometimes frank pus was found in the wound bed in presence of air leaks which probably caused the wound maceration and flare up in infection and in some cases an actual increase in size. The increase in size to the extent reported by **Morykwias MJ**, was not found in our study.

Also, of note was that in cases where in a leak was found at dressing change a lot of exudate was seen collected under the opsite, and excessive maceration was seen around the wound which was dealt with by allowing the wound to remain open to the air and a thorough cleaning was done with normal saline solution the wound edges were cleaned with tincture benzoin solution and allowed to dry before the application of next dressing.

In our study it was also noted with large open wounds on lower extremity it was also observed that the post traumatic distal oedema is greatly reduced in cases where vac is applied along with limb elevation.

Standard precautions before the application of V A C taken in all cases. that all necrotic tissue eschar slough and Debris was surgically debrided under anaesthesia before the application of the negative pressure dressing. An intermediary dressing of non-adhesive paraffin gauze was used, as an interface between wound and sponge in all cases it is found to be very helpful in reducing pain while dressing is changed.

CONCLUSION:

We conclude that a leak in a negative suction dressing is not a welcome phenomenon and should be rectified as soon as a leak is detected.

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