

A Review Of Pressure Ulcer Preventive Mattresses

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Abstract : There exists a number of research studies that have observed efficiency of several support surfaces and mattresses. In this paper we have analyzed this researches and concluded our observation.

Keywords: Alternating pressure air mattresses(APAMs), Alternating pressure(AP) devices, pressure-reduction mattresses(PRM), standard institutional (SI) mattresses, viscoelastic foam(VE) mattress, High Specification Foam (HSF)

INTRODUCTION

Presence of pressure, moisture, shear, friction, lack of nutrition are the factors that leads to pressure ulcers. Increase in the temperature as well as pressure leads to the occurrences of bedsores (1). The critical factor is Pressure for development of ulcer as repetitive repositioning is missing to avoid skin collapse (2). Henceforth inhibition should be primarily focused on lessening of time and scale of pressure applied on the tissue (3). This is where support surfaces come in play. Support surfaces reduce pressure by redistributing it to prevent damage to tissue(4). Pressure ulcer requires techniques that optimizes pressure relief as well as well-maintained nutrition with proper wound care altogether but there is need of more effective prevention treatment and strategies(5).

Air and fluid mattresses, high specification foam mattresses, heel pressure relief devices , low-air-loss beds, medical sheepskins, wheelchair cushions, alternating pressure air mattresses (APAMs),foam overlays, etc are various different types of prevention materials available.

Constant low pressure(CLP) devices reduce pressure and shear and Alternating Pressure(AP) devices adjust according to body shape and vary pressure on body(5). The decision to use pressure reduction support surfaces is determined on the basis of risk of pressure ulcer formation, patient's comfort with surfaces and other factors such as availability of material,etc. (3). There are four stages of pressure ulcer which are identified by severity of wound(6). Sacrum and heels are the two main areas which are more prone to pressure ulcer due to weight of body and their frequent contact with the surfaces(6).Necessity and requirement of more effective prevention devices can be understood by the fact that in Netherland, pressure ulcer is third costliest disorder.

REVIEW

Beeckmana et.al. (4) carried out study to find out more effective prevention device between static air support surfaces and alternating air support surfaces. They had concluded that cost effectiveness and time required to develop pressure ulcer is more in static air pressure support surfaces making them more effective than alternating air support surfaces in pressure ulcer prevention .

Demarre L et.al. (3) in their study of comparison had concluded that there is no significant difference in probability of pressure ulcer prevention. So effectiveness of both the mattresses, i.e. alternating low pressure air mattress with multi-stage inflation and deflation and alternating low pressure air mattress with a standard single-stage inflation and deflation, are equal in pressure ulcer prevention.All the observations were made on development of stage(II-IV) pressure ulcer in (3) and (4).

In January 1997, Janeen Emery Boettger (2) had done study on replacement of standard hospital mattresses with pressure-reduction mattresses for 6 months concluded that replacement of standard hospital mattresses did not had any significant result on pressure ulcer reduction. They suggested turning or repositioning should also be use even with PRMs.

Govind U et.al. (7) in their systematic review on anti-bedsore bed design concluded that alternative for traditional hospital bed is required which should automatically change pressure point at 15 minute cycle and at least support patient with weight of 100kg.

In 2001, the National Institute of Clinical Excellence (NICE) published a guideline for Pressure Ulcer Risk and Prevention (5) .This guidelines suggested to use high specification foam and alternating pressure mattress and other high-tech pressure relieving devices based on overall assessment of the individual.

Tom Defloora et.al. (8) carried out experiment in which they had classified four turning schemes :i) turning every 2 hours on a standard institutional (SI) mattress , ii) turning every 3 hours on a SI mattress , iii) turning every 4 hours on a viscoelastic foam(VE) mattress , and iv) turning every 6 hours on a VE mattress . And also included patients who had received standard preventive care. They had concluded that use of turning schemes with pressure reducing position and materials had not any significant effect on prevention of pressure ulcer Grade-I. But in contradiction to this, turning every 4 hours with pressure-reducing mattress and different positions to reduce pressure are effective in reduction of pressure ulcer grade II-IV.

In 2011, Elizabeth McInnes et.al. (9) in their Cochrane systematic review and meta-analysis of pressure-redistributing support surfaces in preventing pressure ulcers concluded that higher specification foam mattresses and sheepskins, are effective in preventing pressure ulcers. Conclusion on various constant low pressure and high tech devices as well as alternating pressure devices were unclear.

Joshua S. Mervis (10) had stated constant low pressure devices are preferred over standard foam hospital mattress. Low air loss mattress is significant in maintaining skin temperature and reducing moisture which is more effective in prevention of pressure ulcer. Medical sheepskins are beneficial over standard care. Alternating pressure mattresses delay mean time to ulceration by 11 days and cost effective in short hospital stays.

In 2006, Katrien Vanderwee et.al. (11) in their review for effectiveness of alternating pressure air mattresses came to conclusion that APAMs are effective than hospital mattresses. More studies required to evaluate comfort and conclude which APAM is doing good among other and constant low pressure mattresses.

Sandra K. Vyhldal et.al. (12) carried out research on comparison of foam bed mattresses and foam overlays in which result favours the use of foam bed mattresses. Due to “bottoming out” effect (foam compression) foam overlays are likely to be less effective.

Marjolein Woodhouse et.al. (13) concluded that despite of guidelines, offloading of pressure susceptible areas is irregular and not frequent.

Water mattress has very large weight compared to air mattress. There are chances of leakages which are difficult to fix. Patient must be lifted bodily in and out of bed which is difficult for nurses and care-givers(14).

Sayumi Tsuchiya et.al. (15) suggests changing body position of patient every 2 hours will help preventing pressure ulcers. Changing body position may benefit the patient but it will disrupt the patient sleep also it is a burden for nurses and caregivers. Authors also adds that inserting pillow under mattress can help to gain some natural movements and also help reducing pressure ulcers in immobile patients.

JaneNixona, et.al. (16) concluded through their randomized Controlled Trials that repositioning of patient and use of specialist mattress or cushions should be used for prevention of pressure ulcer. Also recommended for prevention of pressure ulcer High Specification Foam (HSF) should be used and use 'High Tech' mattresses where HSF fails.

Tom Defloor and Johan D. S. De Schuijmer(17) concluded that compared to standard operating foam mattress the foam mattress have very little pressure reducing qualities. The pressure reducing gel effect was limited. Visco-elastic polyether and polyurethane proved efficient in reducing pressure. According to them none of the mattresses were successful in prevention of pressure ulcer.

S. Derler et.al.(18) had focused more on shearing and twisting effect due to friction effect between hospital textile and skin and suggested to use textile which will be having low friction and moisture reducing properties.

Richard H.M et.al. (19) had concluded pressure ulcer's main cause in slightly different way. According to them Pressure ulcer is generated due to unrelieved compression of soft tissue for a long period of time. The major areas where pressure ulcers generate are the bony prominences, because at this places higher tissue compression takes place.

Klaus- Dieter Neander et.al. (20) got result that the patients who lay for more than 48 hours on alternating pressure mattress have generated pressure ulcers.

G.-M. Rotaru et.al. (21) also suggested repositioning of body after every 2 hours. In 1958, it was suggested that decubitus ulcer can be prevented by decreasing shear and friction. A combination of synthetic fiber materials has lead to develop water transport which has dry textile surface. This is expected to remove sweat and moisture from the interface reducing skin-textile friction and thus protecting skin under external stresses.

Martin van Leen, et.al.(22) in their result stated to use of static air overlay mattress and regular repositioning for better result. Static air cushion is also most effective for patients in wheelchair with lowest maximum contact points.

Clear-cut evidences can be reported from GBD studies(23-27). Few of the related articles were reported(28-30).

CONCLUSION

Relocation of body of the patient at every 2-3 hours with pressure decrease devices is necessary for consecutive reduction of pressure ulcer. Highly specified foam mattresses and static air supports are extra effective as compare to other. But then again like others they can only delay the time of ulceration and may not be effective in ulcer prevention. Additional studies are essential to evaluate comfort and search best alternating pressure mattresses

among others. There is also a requirement for more reliable pressure reducing (also shear and moisture reduction) device which can alone prevent pressure ulcers.

Proposed design will be more focused on pressure susceptible areas rather than whole body. Design will be composed of both high specification foam and will also alternate pressure points for redistributing and reducing pressure with more comfort relative to other devices which gain more advantage towards prevention of pressure ulcer. It will automatically carry offloading by removing contact area from mattress which are pressure points of body at regular time interval i.e. after every 2 hours for 15 minutes.(This cycle time is also adjustable according to patients comfort and day and night time).Design will be more effective for completely immobile patients due to more focused alteration of pressure points.

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