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Management of Pressure Ulceration Using Fenestrated Foam and Honey: Preliminary Report Of 51 Cases Treated At Ibadan.

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SUMMARY

Background: It has been noted that reduction of pressure over areas most prone to pressure ulceration reduces the chance of development of such ulcers.

Objective: The purpose of this study was to investigate the possible effect of pressure reduction by foam interpositioning at sites most prone to pressure ulceration.

Method: 51 cases of pressure ulcers managed with honey and foam interpositioning were analysed for age, sex, primary diagnosis and distribution of ulcers. Secondly, measurement of pressures exerted in decubtitus and sitting up positions and on different sites of the body of some volunteers with and without foam interpositioning were obtained.

Results: The primary diagnoses of patients were traumatic spinal injury (51%) tumours – craniospinal (16%) and tuberculosis (11%). Ulcer location was mainly sacral (41%), trochanteric (30%) and ischial (11%). They were mainly grade 4 in depth i. e. with bone involvement and formation of bursae. Conservative treatment in addition to patient lying on foam caused improvement in ulcer status in most cases. Pressure measurements revealed reduction of pressure on sacral, trochanteric and ischial areas when 10cm thick foam was inter-positioned.

Conclusion: Pressure reduction by foam interpositioning enhances healing in both operated patients and those managed conservatively.

INTRODUCTION

A pressure sore is an ulceration of the skin and deeper tissues consequent on pressure, shear and frictional forces. They are common in hospitalised patients and are associated with complications like invasive wound infection, osteomyelitis, septicaemia, anaemia, and amyliaidosis.

It is assumed that pressure ulcer develops when pressure at the surface exceeds mean capillary pressure of 32mmHg[1]. This pressure results in tissue ischaemia and necrosis. The distribution pattern of pressure on the surface of the body in healthy males with subjects indifferent positions has been reported[2]. Reduction of pressure at areas of bony prominence i. e. areas most prone to pressure ulceration should reduce the chance of development of a pressure ulcer. This paper investigates the possible effect of pressure reduction by foam interpositioning at sites most prone to pressure ulceration.

METHOD

The first part of this paper was a retrospective review of 51 patients with pressure ulcers referred to Plastic Surgery Unit of University College Hospital, Ibadan between July, 1994 and october, 1997, a period of 40 months. The main source of referral was neurosurgery. Other sources were orthopaedics, medical endocrinology, cardiology and neurology. Patients' records as in case notes, ward admission books, plastic surgery register and referral letters were utilised.

Analysis for age, sex, primary diagnosis, bodily distribution of ulcers, morbidity and mortality was carried out. The patients were placed on honey dressings following debridement (on those requiring it). Foam material, 10cm thick, and 53 cm square with fenestration at the centre was placed between the ulcer site and patient's mattress. This additional treatment was carried out with less frequent turning of the patient (less frequent than the recommended two hourly).

Three patients had operative treatment of their ulcers. This consisted of gluteal thigh fasciocutaneous flap transfer after radical debridement including bone shaving.

The second part of the study consisted of measurements of the pressure exerted in the decubitus and sitting up positions on different sites of the body of volunteers with and without foam interposition, figure 1. Readings were also taken after different diameters of 12cm, 16cm and 20cm were cut at the centre of the foam cushion.

RESULT

Review of Cases

Fifty one patients' records were reviewed of which 36 were males and 15 females, a ratio of 5:2. Age distribution, table I, shows 3 peak incidences: at 21-30, 41-50, and 61-70 year age groups.

The pressure ulcers were seen mostly in patients who had suffered a trauma i. e. 51%, table 2. Of these, the trauma caused quadriplegia in 39% and paraplegia in the remaining 61%. Also of the traumas, 13% were falls, 4% due to gunshots and the rest were road traffic accidents. Tuberculosis was the primary diagnosis in 11%. Rarer primary diagnoses were chronic renal failure in 2 cases and rheumatic cardiovascular disease, cerebrovascular accident in one patient each.

Pressure ulcers were located in the lower part of the body i. e. below the trunk in 96%. There were 30 (41%) sacral ulcers, figure 2, 22(30%) trochanteric, 8 (11%) ischial. Rarer areas of involvement were scalp, lower chest

ear, ankle and knee. All ischial pressure ulcers were noted in paraplegies only and they constituted 20% of pressure ulcers in this group. While the depth in 44% was grade 4 (with bone involvement)[3], 20% were grade 3.

With a relatively conservative treatment of limited bedside debridement, honey dressing and patient lying on fenestrated foam placed on top of the mattress, satisfactory wound healing took place among those who had a recording of progress of management. Healing was noticed as early as day three while in some, conversion from grade 4 to 2 occurred before discharge for home management.

Surgery: Four grade 4 ischial pressure sores in three patients were closed using gluteal thigh local fasciocutaneous flaps, three as sliding and one as a transposition flap. Major wound dehiscence necessitating reclosure occurred in one case. Apart from this, and wound infection which was controlled by antibiotic therapy, post operative period was uneventful.

Morbidity and Mortality: 4 patients acquired tetanus, three were contacted before admission to UCH while in one case, symptoms were noticed twelve days after admission. There were 11 deaths table III. Although the cause was not known in some, septiceamia was diagnosed in three cases.

Foam Cushion Experiment: Median pressure exerted on the ischial tuberosities in the sitting down position, directly or with foam interposition is recorded in table III. Similarly pressure exerted on trochanteric and sacral areas are recorded in the same table. The pressure exerted on the ischial areas was reduced by foam interpositioning and further reduced with 20cm fenestration of the foam. On the trochanteric and sacral regions force exertion was least when a 12cm hole was made in the foam cushion than with a 16cm or 20cm hole.

Table I

Age Distribution of Patients with Pressure Ulcer at Ibadan.

Age	Frequency
11 – 20	5
21 – 30	12
31 – 40	6
41 – 50	9
51 – 60	5
61 – 70	9
71 –80	3

Table II

Primary Diagnoses of Patients with Pressure Ulcer at Ibadan

Traumatic – Spinal Injury	51%
Tumours – Oranial and Spinal	16%
Tuberculosis	11%
Renal failure	4%
Encephalopathy	4%
Diabetes	2%
Rheumatic heart disease	2%
Cerebro vascular accident	2%
Unknown (inadequate records)	8%

Table III

Pressure exerted on three pressure areas around the buttock Median weight of volunteers = 47kg.

Position of subject			Median Pressure in MMHg
Sitting	Directly on mattress	legs off floor	61.0
		legs on floor	50.8
	On foam cushion	legs off floor	48.7
		legs on floor	39.2
	on foam fenestrated 20cm	legs off floor	41.5
		legs on floor	30.5
	Directly on mattress	Right lateral (force on r. trochanter)	19.8
		left lateral (force on 1. trochanter)	17.3
		Supine (force on sacrum)	15.6
	on foam cushion	Right lateral	10.1
		left lateral	10.7
		Supine	9.8
lying	on foam with 12cm fenestration	Right lateral	9.4
		left lateral	11.9
		Supine	7.4
	on form with 16cm fenestration	Right lateral	11.5
		left lateral	11.4
		Supine	8.4
	On foam with 20cm fenestration.	Right lateral	10.3
		left lateral	11.9
		Supine	8.9

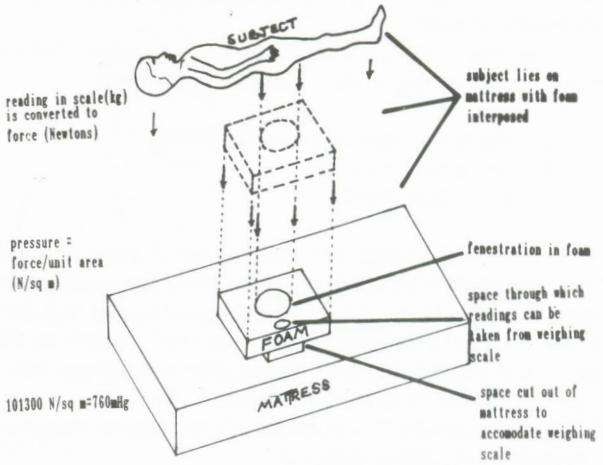

Fig. 1: A technique of measurement of pressure on different sites of the body with foam interpositioning.

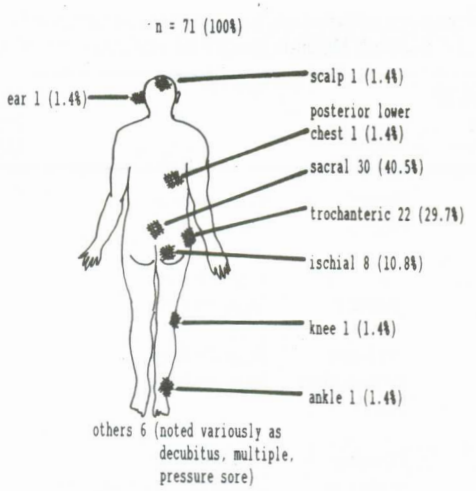

Fig. 2: Site Distribution of Pressure Ulcers.

DISCUSSION

Direct local pressure causes necrosis by obstruction of blood vessels, mechanical damage and tissue deformation. Shear forces contribute to this by stretching and compressing the perforating vessels while friction acts directly by stripping the outermost layer of skin[4]. Pressure increases with proximity to bony prominence[5]. In addition, ulceration may occur due to metabolic deficits resulting from both the duration of occlusion and the demand for nutrients[6]. The higher demand by muscle and its deeper location accounts for the more extensive deep tissue damage seen in pressure ulceration.

The time-pressure interaction is not the only aetiological factor of pressure ulceration. Intrinsic factors such as infection, hypoproteinaemia. anaemia, sensory loss, impaired mobility, old age, faecal and urinary incontinence are worthy of note[7].

Our study highlights the three patient groups that are at risk of developing pressure sores. These are:

1. the neurologically impaired young
2. the elderly and
3. the hospitalised.

Unlike in studies performed abroad, the sacral region was the commonest site of development of pressure ulceration in this study. This may be explained by the high percentage of quadriplegics (who were bed ridden) in this study. It is noteworthy that ischial pressure ulcers which are commonest in most series were seen only in paraplegics in this study. The success of non surgical treatment of pressure ulceration rests on:

1. control of infection
2. debridement of dead tissue and
3. avoidance of pressure[4]. Control of infection in this series was achieved mainly by routine honey gauze dressings. Honey is antiseptic through its peroxidase enzyme system which releases oxygen radicals that are toxic to microbe; and through its low PH and hygroscopic properties[8].

The measures that have been suggested for alternating pressure sites are based on Kosiak's[9] principle that tissue tolerate higher pressures if interspersed with pressure free recovery periods. Thus development of 'pressure consciousness' by patients and nursing personnel is an essential part of prevention and treatment. Patients who are sitting down must lift themselves from their chairs for at least 10 seconds every 10 minutes, and those lying down must be turned every two hours. More sophisticated means are achieved by striker frame, circoelectric bed, ripple mattresses, silastic and low air loss beds. The method of foam interpositioning augments nursing efforts at reducing pressure over prone sites.

Foam interpositioning has been found as in this study to reduce pressure on bony prominence. Foam is a polymer of urethane which is a double bond unsaturated hydrocarbon. It has a low humidity due to its porosity but it also has a low heat flux resulting in high skin temperature[1]. It can be washed and sterilised. Its coverage can be achieved using mackintosh. Fenestrating, or cutting a circular hole in the cushion at the site of bony prominence further reduce the pressure in such areas. This method of pressure reduction enhances healing in both operated patients and those managed conservatively.

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