Yonsei Medical Journal
Vol. 37, No. 3, 1996

Efficacy of Hydrocolloid Occlusive Dressing Technique in Decubitus Ulcer Treatment: A comparative study

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The efficacy of hydrocolloid occlusive dressing technique was compared with that of the conventional wet-to-dry gauze dressing technique in decubitus ulcer of stage I and II. Forty-four patients were randomly divided into two treatment groups and each received treatment according to the two different protocols. As a result, 80.8% of the hydrocolloid occlusive dressing group (group 1) and 77.8% of the conventional wet-to-dry gauze dressing group (group 2) healed completely with no statistically significant difference between the two groups. However, the time required for complete healing was shorter in group 1 with 18.9 days compared to 24.3 days in group 2. Ulcer healing speed was also slightly faster in group 1 with 9.1 mm^2/day compared to 7.9 mm^2/day for group 2. Average treatment time spent by a medical staff member was significantly shorter in group 1 with 20.4 minutes/day compared to 20.7 minutes/day in group 2. The hospital cost of the ulcer treatment was higher in group 2 compared to group 1 even without taking into consideration the medical personnel's labor cost. These results indicate that the hydrocolloid occlusive dressing technique offers less time consuming and less expensive method of treatment compared to the conventional technique in stage I and II decubitus ulcers.

Key Words: Decubitus ulcer, hydrocolloid occlusive dressing, wet-to-dry gauze dressing

Decubitus ulcer frequently develops in patients with sensory deficits, motor deficits, urinary incontinence, fecal incontinence and/or decreased mental status (Moolten, 1972; Manley, 1978; Anderson *et al.* 1982; Allman *et al.* 1986). Its reported prevalence ranges from 3 to 20% of all hospitalized adults (Manley, 1978; Ek and Boman, 1982; Allman *et al.* 1986), and it causes considerable suffering for the patients physically, psychologically, and financially. In spinal cord injured patients, decubitus ulcer incidence is much higher ranging from 24 to 85% with a 7 to 8% mortality rate (Freed *et al.* 1966; Dinsdale, 1974). Its occurrence easily facilitates the onset of infection and complications from immobilization and consequently delays early rehabilitation and mobilization.

The most important aspect of any decubitus ulcer treatment is pressure relief of the ulcerous region of the body (Kosiak, 1961). For deep and extensive ulcers, surgical treatment is frequently considered. However, for local conservative treatment, conventional wet-to-dry gauze dressings with Dakin solution, acetic acid, povidine-iodine or saline is often used (DeLisa and Gans, 1993). This technique has the advantage of removing the attached necrotic tissues during the dressing change; however, on

Received May 27, 1996
Accepted July 8, 1996

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the negative side, granulation tissues and epithelial tissues are also damaged during the frequent dressing changes. Maintenance of a physiological, moist environment away from toxic substances or organisms is prerequisite for ulcer healing (Winter and Scales, 1963; Alper *et al.* 1983). With its tendency to form a moist environment, the hydrocolloid occlusive dressing technique offers an alternative method of conservative management of decubitus ulcers. In hydrocolloid occlusive dressing, hydrocolloid mixes with the ulcer bed to form a gel providing a moist environment allowing free movement of epithelial cells and preventing epithelial injury during a dressing change (Rijswijk *et al.* 1985).

The purpose of this study is to compare the efficacy of the hydrocolloid occlusive dressing to the more conventional wet-to-dry gauze dressing in stage I and II decubitus ulcers, and to determine which is the more effective means of conservative ulcer management.

MATERIALS AND METHODS

Forty-four patients who were admitted to the Department of Rehabilitation Medicine with decubitus ulcers with stage I and II according to the National Pressure Ulcer Advisory Panel (1989) (Table 1) were randomly divided into two treatment groups; a hydrocolloid occlusive dressing group (group 1; n=26) and a wet-to-dry gauze dressing group (group 2; n=18). Patients with decubitus ulcer stage III or IV, with systemic infections, with endocrinological disorders, with difficulty in keeping pressure relieving positions, or with aggravated general conditions due to other factors were excluded from the study.

Table 1. Classifications* of decubitus ulcers

Stage I:	Nonblanchable erythema of intact skin
Stage II:	Partial-thickness skin loss involving epidermis and/ordermis; ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater
Stage III:	Full-thickness skin loss involving damage of necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia; ulcer presents clinically as a deep crater with or without undermining of adjacent tissue
Stage IV:	Full-thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone or supporting structures

*: The classification is developed by the National Pressure Ulcer Advisory Panel (1989) and is recommended in the clinical practice guidelines prepared by the Association for Healthcare Policy Research, USA

For the wet-to-dry dressing group, the ulcers were cleansed with saline irrigation and boric solution before applying povidine soaked wet gauze. The wet gauze was covered with a layer of dry gauze. Whenever the necrotic tissues appeared, aggressive debridement was done until viable tissues showed. The dressing was changed three times per day. For the hydrocolloid occlusive dressing group, ulcer cleansing and debridement were done with the same principle, but the dressing change was done every 4 to 5 days with application of hydrocolloid occlusive dressing material, DuoDERM® (Squibb, Princeton, N.J., USA). However, when there was copious amount of discharge enough to leak out from the dressing even before the scheduled dressing time, the overflowing discharge was cleansed whenever needed. Ulcer size was estimated by measuring the longest diameter and the longest diameter perpendicular to it. It was measured at least every 4 days. The healing speed was calculated by dividing the changes of the ulcer size by the treatment days required. The treatment time and cost were also calculated. Other variables considered and measured were ulcer site, size and degree, presence of necrotic tissues and exudate, serum albumin and hemoglobin level, and urinary or fecal incontinence.

For all patients, position change to relieve pressure to the ulcer site was continuously practiced. Complete healing was considered when no further dressing changes were required. The chi-square and t-test were used for the statistical analysis.

Table 2. Comparison of the patient profile

	Group 1 (n=26)	Group 2 (n=18)
Male: female	23:3	13:5
Mean age*(yrs)	50.5±18.3	46.9±16.8
Hypoalbuminemia(<3 g/dL)	5	1
Anemia(<10 g/dL)	7	1
Urinary incontinence	19	12
Fecal incontinence	10	7

*: Values are given as mean and SD

Table 3. Comparison of the ulcer characteristics

	Group 1 (n=26)	Group 2 (n=18)
Exudative	11	5
Necrotic	15	5
Stage I	6	6
Stage II	20	12
Sacral ulcer	7	4
Other pelvic girdle ulcer	7	7
other regions	12	7
Ulcer size(mm^2)*	172	192

*: Values are given as average

Table 4. Comparison of the ulcer healing results

	No. of cases(%)	
	Group 1	Group 2
Complete healing	21(80.0)	14(77.8)
Hypergranulation	3(11.5)	0
Failure by conservative means	2(7.7)	4(22.2)

Table 5. Comparison of the treatment results

	Group 1	Group 2
Treatment duration(days)	18.9± 8.2	24.3±11.2
Dressing time(min)	20.4±12.2 *	201.7±112.2
Healing speed(mm^2/day)	9.1± 5.4	7.9± 4.7
Cost(won)	8,204±2,664 *	14,571±6,700

Values are given as mean and SD.
*: $p<0.05$

RESULTS

The mean age and gender ratio were nearly identical between the two groups. Systemic factors such as anemia, hypoalbuminemia, or incontinence, which affect the course of ulcer, were more frequently found in group 1, but the difference was not statistically significant (Table 2).

The mean ulcer size were 2.99±2.63 cm^2 in group 1 and 2.71±2.13 cm^2 in group 2, respectively. The presence of the exudate and the necrotic tissue as well as distribution of ulcer stage and site were similar between the two groups (Table 3).

The healing rates of the two groups were not statistically significant with 80.8% for group 1 and 77.8% for group 2. However, three cases developed hypergranulation in group 1, and they were treated with povidine-iodine gauze until complete healing was achieved (Table 4).

The average treatment duration and healing speed was slightly shorter and faster in group 1 compared to group 2, but they were not statistically significant. However, the average treatment time spent for group 1 was significantly shorter and the average treatment cost was significantly lower than for those of group 2 ($p<0.05$)(Table 5).

DISCUSSION

Development of decubitus ulcer requires more time spent by medical staff for ulcer treatment, lengthens hospital stay, increases hospital cost, delays the beginning of an active rehabilitation program, and postpones a more independent and active life. Furthermore, patients with ulcers are more vulnerable to complications like infections, contractures, and disuse atrophies as well as psychological depressions. A whole array of problems is precipitated in a domino effect. In the case of any decubitus ulcer, pressure relief

is the most important treatment regime. Once achieved, a fast healing, comfortable, less time consuming and cost-effective method of treatment is required. There are various treatment methods available, but none seems to be superior to the others (Moolten, 1972; Manley, 1978; DeLisa and Gans, 1993).

There were a few studies comparing various treatment methods. Friedman and Su (1984) reported that healing rate and healing speed with the hydrocolloid occlusive dressing technique were similar to those with the conventional wet-to-dry gauze dressing technique. Our study found slightly faster healing rate and speed with the hydrocolloid occlusive dressing technique which were not statistically significant. However, many others reported faster healing of the hydrocolloid dressing technique (Yarkony *et al.* 1984; Gorse and Messner, 1987; Xakellis and Chrischilles, 1992).

One of the biggest advantages of the hydrocolloid occlusive dressing is that it requires shorter time in dressing changes as has been previously reported (Brady, 1987; Gorse and Messner, 1987; Xakellis and Chrischilles, 1992; Colwell *et al.* 1993). Less frequent and less time consuming hydrocolloid dressing causes less discomfort for the patients. Furthermore, because the hydrocolloid occlusive dressing only requires dressing changes every 4 to 5 days, less severely affected patients could be treated as an out-patient. The cost effectiveness is another issue to be considered when comparing different methods of treatment especially in the area of personnel involved; cost of the dressing materials; insurance payment; etc. Many studies on this matter reported better cost effectiveness of the hydrocolloid dressing method compared to the conventional method (Brady, 1987; Gorse and Messner, 1987; Xakellis and Chrischilles, 1992; Colwell *et al.* 1993). We only considered the cost of the dressing materials and found similar results, but the cost would be saved even more if the decrease in dressing time is taken into account for the decrease in the labor cost.

Rapid proliferation of the granulation tissues in the hydrocolloid occlusive dressing has been observed in previous studies (Kanof, 1964; Winter, 1965; Ashurst, 1975; Tracy *et al.* 1977; Alper *et al.* 1983) including animal studies (Hinman and Maibach, 1963; Geronemus and Robins, 1982; Alvarez *et al.* 1983). In our study, 3 cases of hypergranulation as complications of occlusive dressing were found. Hypergranulation can result from inflammation or infection and the moist environment can facilitate the inflammatory or infectious process requiring termination of the occlusive dressing technique (Bennett, 1982). In our cases, overgrowth of the granulation tissue occured as inflammatory process adversely shielded by the occlusive moist environment without evidence of infection. We were not able to identify other predisposing factors to the complication. In dealing with this complication, some used lyofoam to treat the hypergranulation (Harris and Rolstad, 1992) while others changed the dressing technique to the wet-to-dry gauze dressing (Friedman and Su, 1984). We used povidine-iodine gauze to deal with the hypergranulation tissues and found good results of complete healing. Possibly because iodine has a deleterious effect on epithelialization, is why it works benevolently in the case of hypergranulation in controlling the overgrowth of new tissues.

Although hypergranulation can occur in certain cases, on the whole, the hydrocolloid occlusive dressing technique is found to be more effective means of treating decubitus ulcers of stage I and II than the conventional wet-to-dry gauze dressing technique. Furthermore, if hypergranulation or any infectious signs develop, the dressing can easily be changed to the povidine-iodine gauze dressing or any other conventional dressing techniques.

In conclusion, the hydrocolloid occlusive dressing technique has proven its value in both dressing time efficiency and cost effectiveness in less severe cases of stage I and II ulcers.

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