

## A comparative study between collagen dressing and silver sulphadiazine dressing in scald burn with special reference to wound healing and hospital stay: A hospital-based retrospective study

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### Abstract

**Background:** Scald burn is usually a first- and second-degree burn and usually more common in children, especially from the accidental spilling of hot liquids. Collagen dressing is a standard dressing material for scalds due to the faster healing of scald burn wounds. **Aim and Objective:** To compare the efficacy of collagen dressing over silver sulfadiazine dressing in scald burn cases. **Materials and methods:** This retrospective study was conducted in J.K. hospital Bhopal, including 30 patients with scald burns. These patients were treated with either collagen dressings or silver sulfadiazine dressing taking 15 patients in each group. **Result:** A total of 30 patients were included. In the silver sulphadiazine group, 73.3% of patients belonged to the paediatric age group, 53.3% of patients were male and 46.7% were female, the average number of dressings was 12.5, the average time for complete healing of the wound was 14.5 days, average hospital stay was 16.7 days and split skin grafting required in 3 patients. In the collagen dressing group, 60% of patients belonged to the paediatric age group, 60% of patients were male and 40% were female, the average number of dressings was 2, the average time for complete healing of the wound was 12.3 days, average hospital stay was 13.7 days and split skin grafting required in 1 patient only. **Conclusion:** Collagen dressing is one of the advancements in burn care with rapid wound healing, reduced number of dressing changes, reduced hospital stay, minimal complications and minimal need for split skin grafting.

**Keywords:** Burns, Scald, Collagen dressing, Silver sulfadiazine dressing.

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### Introduction

Scald burn is a form of a thermal burn resulting from hot fluids such as high-temperature water or steam. Scald burns are usually first- and second-degree burns. Scald is derived from the Latin word "Calidus" which means hot. Scalds are usually more common in children, especially from the accidental spilling of hot liquids like hot water, tea, coffee or cooking foods. Management of scald burn includes debridement, followed by dressing with topical preparation such as Povidone iodine, antibiotic ointment, silver ointment etc. Various new dressing materials, like calcium alginate, hydro-colloid membranes and fine mesh gauze are also available for the management of scald burn. These conventional dressings are permeable to bacteria. On the other hand, biological dressings like collagen, create the most physiological interface between the wound surface and environment and are impermeable to bacteria[1]. Collagen dressing is being used nowadays as a standard dressing material for scalds all over the world due to the faster healing of scald burn wounds. In the present study, Collagen dressing is being compared with conventional dressing materials like silver sulfadiazine in the management of scalds burns.

### Materials and methods

This retrospective study was conducted in J.K. hospital Bhopal. A total of 30 patients with Scald burn on different parts of the body and with a different mode of scald burn, treated in our department with either collagen dressings or one of the conventional silver sulfadiazine dressings, over one year were included in the study. The medical record department obtained case records of patients with scald burns. The following details of patients were recorded age, sex, clinical examinations of burn wound, number of dressings and operative procedure if performed.

Patient records were analysed with special reference to hospital stay and recovery from burn wounds. In all patients with scalds in case records, protocols of management were found to be the same, with the initial diagnosis being made based on detailed history and clinical findings with burn wound examination. The patients were divided into two groups; 'Collagen dressing' and 'Silver sulfadiazine dressing'. The daily status of scald burnswoundslike size, edge, floor characteristics, slough and granulation tissue were noted and analysed according to hospital records.

Conventional dressing included dressing with silver sulphadiazine ointment (1%) which was done after cleaning the wound with normal saline daily or on an alternate day as per the individual case.

On the other hand, collagen dressing was applied in sedation or general anaesthesia in the operation theatre over the affected site after a thorough cleaning with normal saline and debridement of burnt skin. Plain collagen sheets (Kollagen sheets; Educare Pharmaceuticals Pvt Ltd) of appropriate size were selected and thoroughly rinsed in normal saline before application. These sheets were applied over the burn wound and secured with chromic 4.0. These collagen dressings were kept for 4-5 days and after that burn wound was examined for healing if found that the wound is not healed completely with some raw area then collagen dressings were again performed.

As per the document, both these groups were treated with intravenous fluid therapy (according to the parkland formula), culture-specific antibiotics and analgesics. Time of recovery was noted in terms of the progression of wound healing, granulation tissue formation, changes in edges of wounds and further need for skin grafts.

The burn wound which shows non-healing at 2 weeks was considered for skin grafting. The wound healing in these cases was considered from the day of injury to the day of split skin grafting.

### Inclusion criteria

1. The patients who are willing to participate in the study after giving written informed consent.
2. Patients with partial-thickness scald burns

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**Exclusion criteria**

1. Persons not capable of giving consent (psychiatric patients) or who refused to give consent
2. Patient with full thickness scald burns
3. Patients allergic to collagen
4. Pregnant women

**Results**

A total of 30 patients were included.

**In the silver sulphadiazine group following findings were observed –**

1. 73.3% of patients belonged to the paediatric age group
2. 53.3% of patients were male and 46.7% were female

3. Average number of dressings was 12.5
4. Average time for complete healing of the wound was 14.5 days
5. Average hospital stay was 16.7 days
6. Split skin grafting required in 3 patients for complete healing of the wound

**In the collagen dressing group following findings were observed –**

1. 60% of patients belonged to the paediatric age group
2. 60% of patients were male and 40% were female
3. Average number of dressings was 2
4. Average time for complete healing of wound was 12.3 days
5. Average hospital stay was 13.7 days
6. Split skin grafting required in 1 patient only for complete healing of wound .

**Table 1: Silver Sulphadiazine Ointment dressing group**

	Age	Sex	Number of dressings	Time of healing	Hospital Stay (Days)	Need of SSG
1	2	M	9	10	13	NO
2	2	F	13	14	16	NO
3	4	M	17	19	20	NO
4	5	F	18	19	23	YES
5	6	M	15	17	19	NO
6	7	M	16	18	20	YES
7	8	F	15	20	21	YES
8	8	M	10	11	15	NO
9	9	F	9	13	14	NO
10	9	F	13	16	18	NO
11	10	M	8	11	13	NO
12	24	F	9	10	15	NO
13	32	F	15	16	17	NO
14	36	M	11	13	13	NO
15	44	M	9	11	14	NO
			12.5	14.53	16.73	

**Table 2: Collagen dressing group**

	Age	Sex	Number of dressings	Time of healing (Days)	Hospital Stay (Days)	Need of SSG
1	4	F	1	8	10	NO
2	4	F	3	10	11	NO
3	5	M	2	9	12	NO
4	6	M	1	13	15	NO
5	7	F	3	12	14	NO
6	7	M	2	15	15	NO
7	8	M	2	21	21	YES
8	9	M	1	17	18	NO
9	9	F	3	14	14	NO
10	11	M	3	13	16	NO
11	16	M	2	9	10	NO
12	17	F	1	11	12	NO
13	35	M	1	10	11	NO
14	46	M	2	8	9	NO
15	56	F	3	15	17	NO
			2	12.33	13.66	NO

**Table 3: Characteristics of the patients in the ‘Silver sulfadiazine Group’ and ‘Collagen group’**

Patient characteristics		Silver Sulphadiazine dressing group (n=15)		Collagen dressing group (n=15)	
		No. of Cases	%	No. of Cases	%
Sex	Male	8	53.3	9	60
	Female	7	46.7	6	40
Age	0-10 years	11	73.3	9	60
	11-40	3	20	4	26.6
	>40 years	1	6	2	13.3
Number of dressing required		12.5		2	
Average time for complete healing		14.5		12.3	
Average Hospital stay		16.7		13.66	
Need of SSG		3		1	

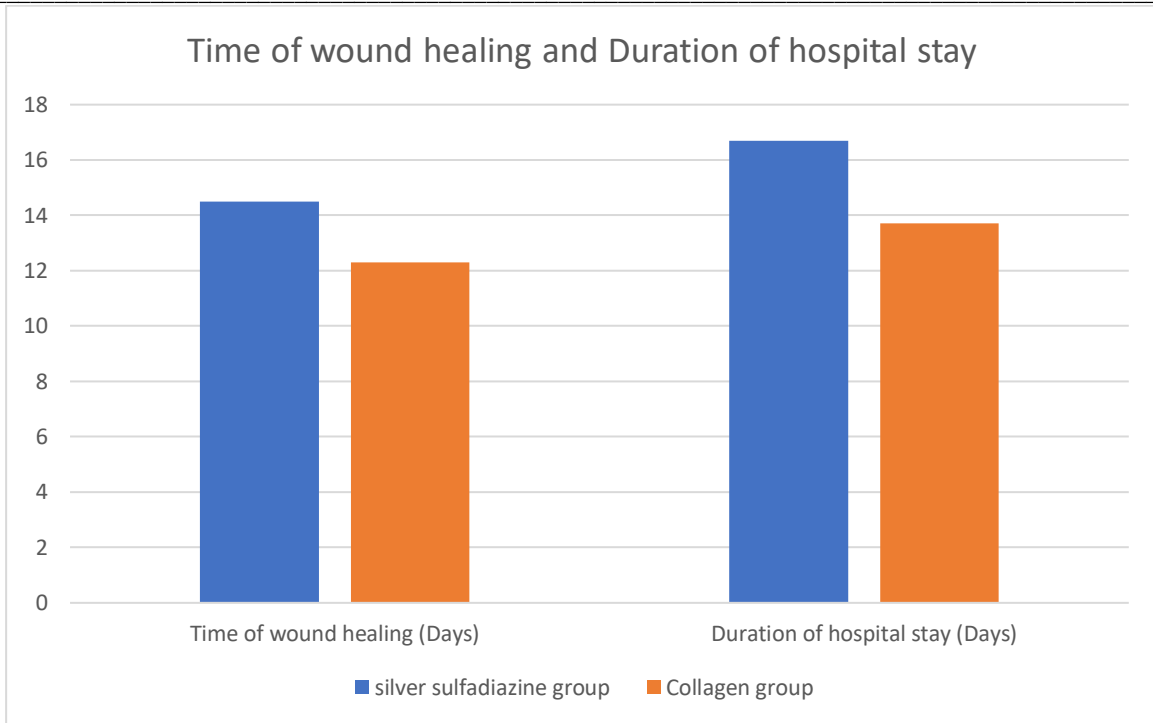


Fig. 1: Time of wound healing and Duration of hospital stay

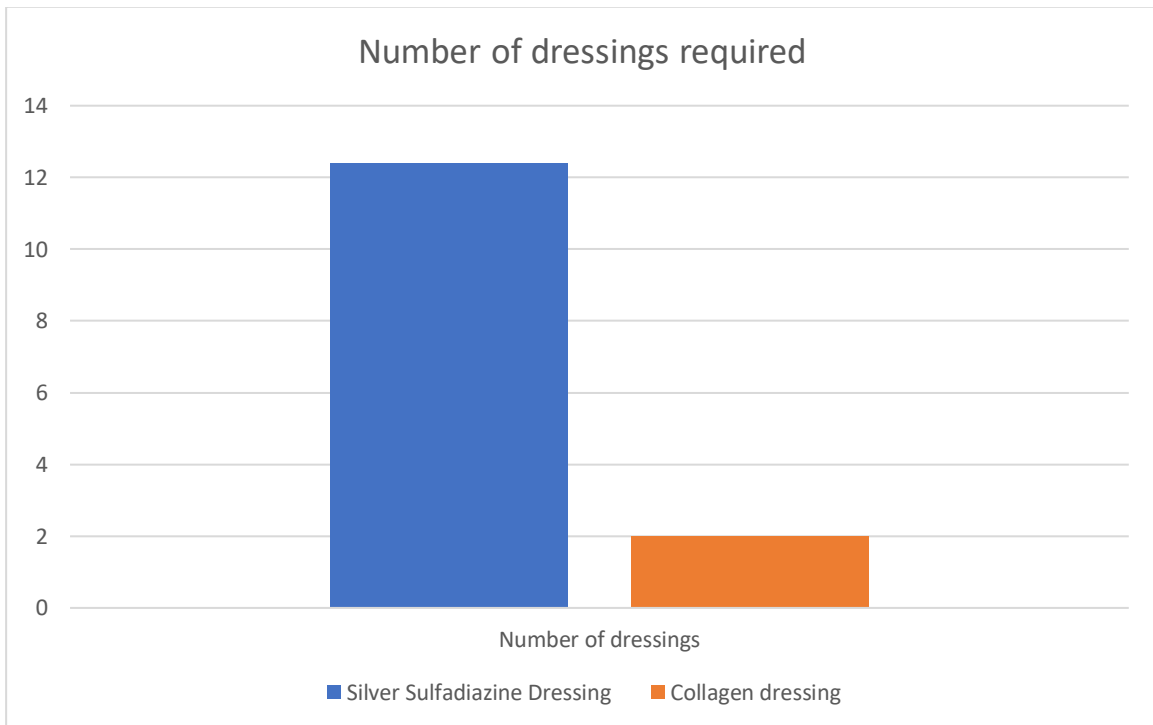
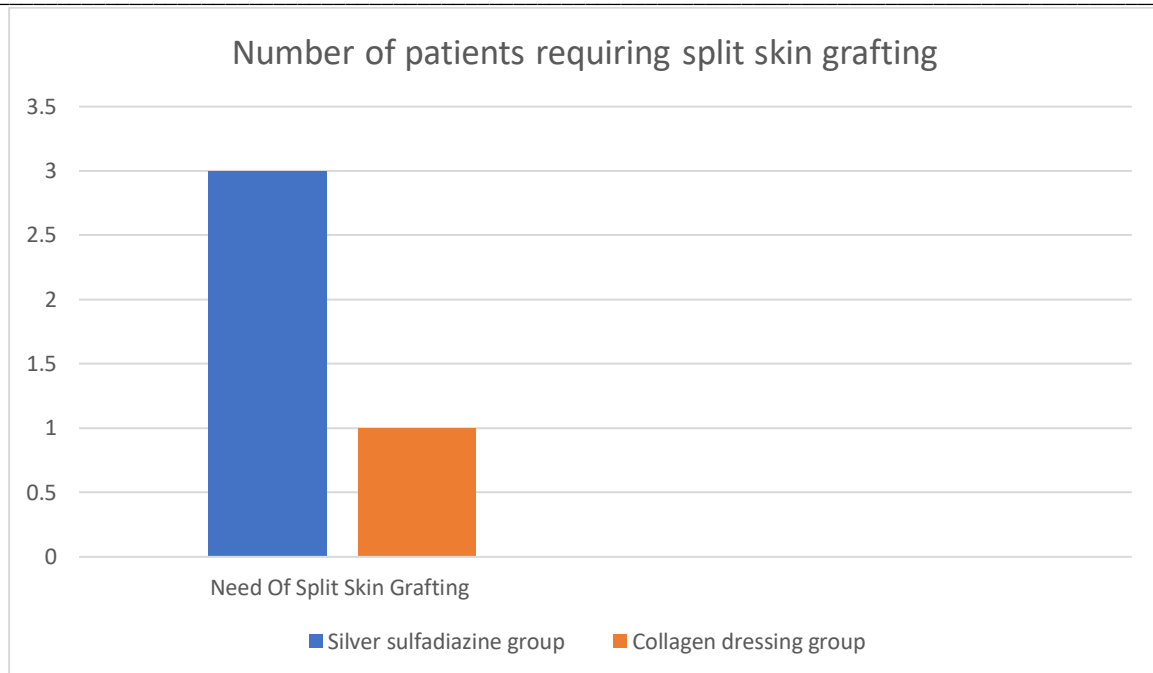


Fig. 2: Number of dressings required



**Fig. 3: Number of patients requiring Split Skin Grafting**

### Discussion

Scalds are very common to burn injuries, especially in the paediatric age group, presenting in the emergency department of a hospital. According to a study of the paediatric population, scalds burn injuries were the most common thermal injury with 569 (41.0 %) reported[2]. In the present study, we also observed, that the most common age group for scald were of paediatric age group (below 10 years) in both groups.

Scald burns are usually caused by liquids, grease, or steam. Spill and immersion scalds are the two modes of injury in liquid scalds burn. These burn injuries can lead to significant morbidity and mortality, including both physical and psychological sequelae, with a considerable associated health-economic impact[3, 4, 5].

In the present study, we found that males are more affected by scald burn injuries than females in both groups. This is supported by previous research, which suggests more male children presented to the emergency department with scalds and burn injuries than females[2, 4].

The management of scald burn is similar to the treatment of any thermal burn including intravenous fluid therapy, culture-based intravenous antibiotics and analgesics. Like another thermal burn, silver sulphadiazine and silver nitrate are more commonly available dressings for partial thickness burn. Other Commonly used topical agents for partial-thickness burns include antimicrobial ointments, silver-containing agents, bismuth-impregnated petroleum gauze, chlorhexidine, and mafenide[6, 7].

Silver sulphadiazine (SSD) is among the most commonly used dressings for scald burns. Silver sulfadiazine disrupts bacteria by damaging the cell membrane and the cell wall rather than by inhibiting folic acid synthesis. Silver sulfadiazine has a wide spectrum of bactericidal activity against both gram-positive and gram-negative organisms. For the prevention and treatment of burn wound infection due to susceptible organisms in patients with second and third-degree burns, silver sulfadiazine is used as a 1% topical cream. Although silver sulfadiazine (SSD) has been the standard topical antimicrobial for burn wounds; however, it has some adverse effects such as argyria, leucopenia, and hepatic, and renal toxicity[8, 9, 10, 11]. Thus it demands new therapy options for better burn wound management.

With recent advances in burn management, many biological dressing materials are now available which have more advantages in terms of

faster wound healing, less pain and reduced hospital stay. One of the biological dressing materials is collagen. There are other several different collagen dressings available such as gels, pastes, polymers, oxidized regenerated cellulose (ORC) etc. The collagen within these products tends to be derived from bovine, porcine, equine, or avian sources, which is purified to render it non-antigenic[12]. The collagen content in each collagen dressing can vary in concentration and type. Collagen dressings have a variety of pore sizes and surface areas, as well. All these attributes are meant to enhance the wound management aspects of the dressings. Many collagen dressings contain an antimicrobial agent to control pathogens within the wound[13].

Collagen is a biomaterial that encourages wound healing through deposition and organization of freshly formed fibres and granulation tissue in the wound bed thus creating a good environment for wound healing[16]. Collagen sheets, when applied to a wound, not only promote angiogenesis but also enhance the body's repair mechanisms[1,15]. Collagen dressings have other advantages over conventional dressings in terms of ease of application and being natural, non-immunogenic, non-pyrogenic, hypo-allergenic, and pain-free[14, 15].

Burn injuries produce coagulative necrosis of the skin and underlying tissues. Superficial burns heal in 5–7 days without any scarring. While superficial dermal or deep dermal burns take 2–4 weeks to heal and are extremely painful. Second-degree burns if not treated promptly and properly may get infected and converted into third-degree, i.e., deep burns resulting in scarring and contracture formation. In the present study first and second-degree burns usually healed within 14.5 days and 12.3 days in silver sulfadiazine and collagen dressing. As per the present study, healthy granulation also appeared significantly earlier in collagen-treated burn wounds as compared to silver sulfadiazine-treated ones. Thus in the present study, most patients with collagen dressing were reported to achieve early wound healing with lesser dressings and more comfort as compared to those who applied silver-sulphadiazine cream. A similar result was observed by Gupta et al who recorded an average healing time of 14 days in patients treated with collagen dressing while Tayade et al recorded 12.64 days in the collagen group and 18.44 days in the silver sulphadiazine group[16, 17].

According to the present study, hospital stay was also found to be reduced in the collagen dressing group (13.7 days) in comparison to the Silver sulfadiazine group (16.7 days). Similarly in another study by A. Singh et al, hospital stay for patients with collagen application was comparatively lower and collagen application was a one-time process while silver sulfadiazine dressings were repeated daily[18]. Also in the present study, we observed that collagen dressing may avoid the need for split skin grafting. Split skin grafting was needed less (1 out of 15) in the collagen group while it was more (3 out of 15) in the silver sulfadiazine group. Thus there are multiple advantages of collagen sheets application over the conventional silver sulfadiazine ointment application. In the present study, Collagen dressing was usually done one to three times with an average number of dressings to be 2. On the other hand, silver sulfadiazine dressing should be done on an almost daily or an alternate day basis with the average number of dressings being 12.5. This fact suggests that in the collagen group, less dressing is required which eventually gives the advantage of less pain associated with dressing. The complaint of pain during dressing is more common in patients in the paediatric age group, thus minimizing psychological trauma and fewer wound complications. So collagen dressing is very effective and beneficial in the management of burns in children. We have observed that

The only disadvantage of collagen dressing is the cost of collagen sheet application and the need for an operative facility in a hospital as most of the dressings are usually performed under general anaesthesia or sedation. This requirement further increases the cost of this procedure. Usually collagen dressing is usually performed once or twice so this lesser need for frequent dressing and reduced hospitalization outweighs this drawback of the collagen application procedure and this easily offsets the cost factor. As far as the limitation of our study is concerned, the small sample size is the drawback of our study which needs a study with a large sample size. Also, this study as a retrospective one did not include an important and more useful issue of the cost.

#### Conclusion

Scald burn is a problem which poses a psychosocial and financial burden on the patient. There are various dressing techniques available nowadays with the advancement of modern medical science. Collagen dressing is one of these advancements, that can be used for burn wounds over any part. It causes rapid wound healing, reduces the number of changes of dressing and reduces the time of hospital stay. Also, it avoids the need for split skin grafting with minimal complications. We conclude that collagen-based dressing is a very good modality of treatment for burn wounds with the advantages of being cost-effective.

#### Source of Support

Nil

#### Conflict of Interest

None declared

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