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Assessment of Silver Sulfadiazine Dressing in the Non-Operative Management of Omphalocele

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Abstract **Original Research Article**

Background: Non-operative management of omphalocele, a congenital abdominal wall defect involving abdominal viscera protrusion through the umbilical cord base, poses significant neonatal care challenges. Silver sulfadiazine dressing, renowned for its antimicrobial and wound-healing properties, is emerging as a potential adjunctive therapy for omphalocele. ***Aim of the study:*** This study aimed to assess the effectiveness of silver sulfadiazine dressing in the non-operative management of omphalocele. ***Methods:*** This prospective interventional study was carried out at Dhaka Medical College and Hospital (DMCH), Dhaka, Bangladesh, from March 2018 to June 2020. The study included 10 neonates with omphalocele who received silver sulfadiazine dressing. Random sampling was employed for participant selection, and data were collected using a pre-designed data collection sheet. Analysis and presentation of data were done using the MS Office suite. ***Results:*** The average age of the participants was 1.0±1.15 years, and 60% of them were male. Participants with omphaloceles showed diverse sac sizes, with 10% having sacs ≤5 cm, and 90% >5 cm (mean 7.30 cm ± 2.58 cm). Eschar formation took 7.70±2.62 days. Initial hospital stays averaged 9.10±1.91 days. Epithelization commenced in 18.90±3.60 days. Full epithelization across participants averaged 103.30±16.74 days. ***Conclusion:*** Eschar formation and initial hospital stays are as expected, but complete epithelization is significantly prolonged, highlighting the need for ongoing care. Our recommendation for medical practitioners is to tailor care to omphalocele patients, especially regarding epithelization management, considering individual needs and optimizing the process.

Keywords: Silver sulfadiazine, Dressing, Non-operative, Management, Omphalocele, Scarification.

1. INTRODUCTION

Omphalocele is one of the major congenital abdominal wall defects, leaving abdominal content eviscerated into the umbilical cord through the umbilical ring and exposed to the environment. The disease's incidence is estimated at 1/4000-7000 live births and affects 10-30% of cases involving chromosomal anomalies with a high mortality rate. Only about 60% of children with such malformations survive until the end of their first years of age [1]. The well-established risk factors contributing to the prognosis include the defect's size, antenatal rupture of the sac, low birth weight, gestational age, associated anomalies, and prenatal respiratory distress [1]. Omphalocele occurs due to a failure of the four embryonic folds to meet in the midline and form an umbilical ring before the 10th week of gestation, resulting in a ventral abdominal wall defect of varying degrees [2]. The optimal route of delivery is still controversially discussed, and clinicians should consider factors such as the defect size, herniated organs in the sac, the integrity of the sac, and any other associated abnormalities [3]. Associated anomalies include congenital heart disease, chromosomal, renal genitourinary, fascial, skeletal, and gastrointestinal anomalies [4]. The omphalocele size varied, ranging from 4 to 12 cm. Omphalocele major has a defect of more than 5 cm diameter, while the minor has a less than 5 cm diameter. The size of the omphalocele and abdominal cavity is related to surgical planning. Omphalocele treatment aims to close the abdominal wall defect after reducing the abdominal content and stabilization with supportive care. In general, treatment strategies may be classified as immediate (primary), staged repair with delayed primary closure, and delayed repair (paint and wait) with secondary closure of the abdominal wall

hernia. In recent years, the most used method is non-operative delayed closure, which involves the maintenance of the sac with topical medication and regular dressing, providing epithelization and subsequent closure of the ventral hernia with delayed surgery. This treatment is often chosen for infants with giant omphalocele and/or a high degree of abdominal-visceral disproportion [5]. The reported prevalence of omphalocele in India is 0.9–3.8 per 10,000 live births and is associated with various syndromes and anomalies, including Beckwith-Wiedemann syndrome, OEIS complex (Omphalocele, Exstrophy, Imperforate anus, Spinal defect), and pentalogy of Cantrell [6, 7]. Many methods have been used to achieve sac coverage and epithelialization, especially in cases of giant omphalocele. Ein SH's study [9] on 20 infants with giant omphalocele treated with silver sulfadiazine (SSD) showed promising results, especially for those who cannot undergo immediate closure. The objective of this study was to assess the effectiveness of silver sulfadiazine dressing in the non-operative management of omphalocele.

2. METHODOLOGY

This prospective interventional study was carried out in the Department of Pediatric Surgery at Dhaka Medical College and Hospital (DMCH), Dhaka, Bangladesh, spanning from March 2018 to June 2020. The study enrolled a total of 10 neonates with omphalocele who were treated with silver sulfadiazine dressing. Random sampling was employed for sample selection, and the study received approval from the hospital's ethical committee. Informed consent was obtained from all participants, adhering to the principles outlined in the Helsinki Declaration [10] and compliance with the General Data Protection Regulation (GDPR) [11]. Neonates with ruptured omphalocele sacs and unstable patients were excluded based on the study's exclusion criteria. Demographic and clinical data were meticulously recorded and managed using a pre-designed data collection sheet within the MS Office program.

3. RESULT

The age distribution of the 10 participants in this study with omphalocele treated using silver sulfadiazine dressing showed varying durations since birth. The majority, comprising 60%, were 1-day old, while 30% were born on the day of the intervention. One participant (10%) was 4 days old, and none were 2 days old. On average, the neonates in this study were approximately 1.0±1.15 days old at the time of treatment. More than half of the neonates (60%) were male and the rest of 40% were female. According to the birth history, most of the neonates (80%) had received antenatal care, while a minority (20%) did not. In terms of delivery, the majority (90%) were born full-term, with only one neonate (10%) born prematurely. Regarding birth weight, 50% of the neonates weighed 2.5 Kg or less, while the other 50% weighed more than 2.5 kg. On average, the birth weight of the participants was 2.70±0.57 Kg. The omphalocele sac size of participants varied, with 10% having a sac size of 5 cm or less, and 90% having a sac size greater than 5 cm, with a mean size of 7.30 cm ± 2.58 cm. The mean ±SD time to eschar formation in neonates was observed to be 7.70±2.62 days. During the initial admission, the total participants had an average hospital stay of 9.10±1.91 days. The average time for epithelization to begin in neonates was 18.90±3.60 days. The average time for complete epithelization in all participants was 103.30±16.74 days.

Table 1: Age distribution of participants, (N=10)

Age (Day)	n	%
0	3	30%
1	6	60%
2	0	0%
4	1	10%
Mean ±SD	1.0±1.15	

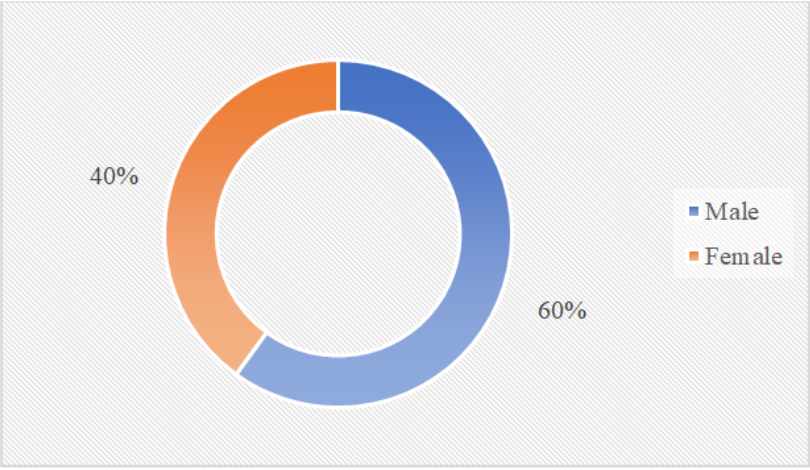

Figure I: Gender distribution

Table 2: Birth history distribution, (N=10)

Characteristics	n	%
Antenatal care		
None	2	20%
Visit	8	80%
Delivery		
Premature	1	10%
Full term	9	90%
Birth weight (Kg)		
≤2.5 Kg	5	50%
>2.5 Kg	5	50%
Mean ±SD	2.70±057	

Table 3: Omphalocele sac size of participants, (N=10)

Size in cm	n	%
≤5 cm	1	10%
>5 cm	9	90%
Mean ±SD	7.30±2.58	

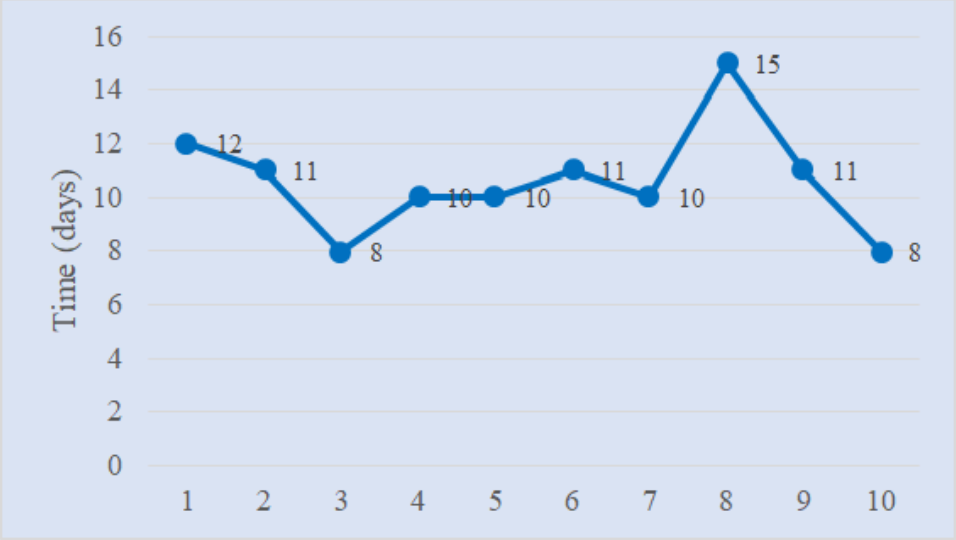

Figure II: Neonatal scarification time, (N=10)

Figure III: Initial hospital stay duration, (N=10)

Figure IV: Neonatal epithelization onset time, (N=10)

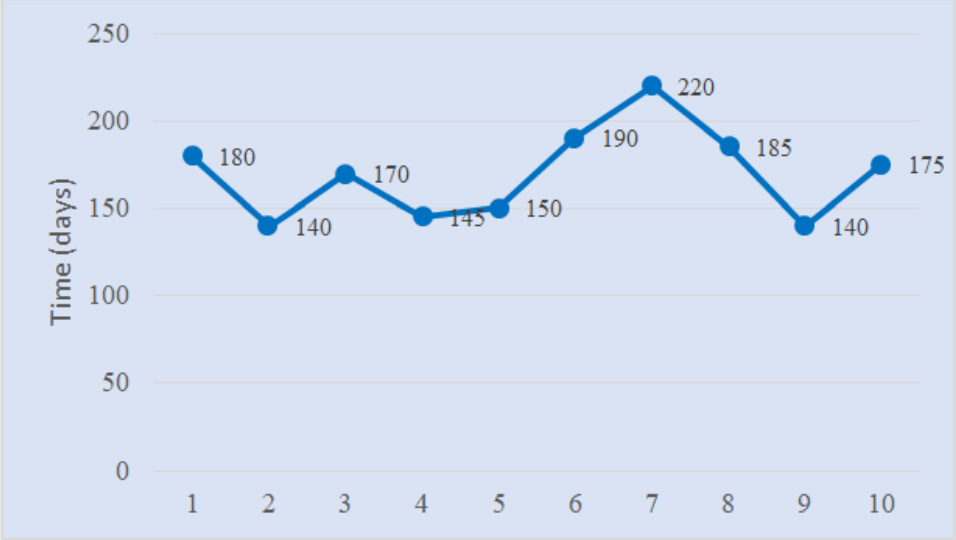

Figure V: Neonatal epithelization completion time, (N=10)

4. DISCUSSION

This study aimed to assess the effectiveness of silver sulfadiazine dressing in the non-operative management of omphalocele. The 10 participants in this omphalocele study treated with silver sulfadiazine dressing had diverse ages, with 60% being 1 day old and 30% receiving treatment on their day of birth. One neonate (10%) was 4 days old. On average, participants were around 1.0±1.15 days old. Among them, 60% were male, while 40% were female. The study's results align closely with those of previous research conducted by Mac-Bird *et al*., [12] and Rattan *et al*., [13], as they both observed a higher incidence of omphaloceles in males compared to females. Concerning delivery, the majority (90%) of our neonates were born at full term, with only one neonate (10%) delivered prematurely. Concerning birth weight, 50% of the neonates weighed 2.5 kg or less, while the remaining 50% had a birth weight exceeding 2.5 kg. The study's findings closely align with those of previous research, particularly a study by reference [14], which reported an average birth weight of 2.84 kg. In this study, the majority of participants (90%) had an omphalocele sac size larger than 5 cm, with an average omphalocele size of 7.30±2.58 cm. These results are consistent with the findings of another research work referenced as [9], where omphaloceles were characterized as defects larger than 10 cm in diameter. Additionally, three babies in our study exhibited a narrow neck of the sac (<5 cm). Depending on the size of the defect (< or >5 cm) and the content of the sac (partial or whole liver), omphaloceles can be classified as minor or major, respectively [15]. The study observed that the time to scarification was an average of 7.70±2.62 days for all neonates with omphalocele treated with

silver sulfadiazine (SSD). These findings are notably similar to those reported in other research works. Marical *et al*., [16] found a time to scarification of 7.72±2.59 days in their study using the silver sulfadiazine dressing method. Similarly, in a study conducted by Kogut and Fiore [14], the time to escharification was reported as 7.69±2.36 days in the silver sulfadiazine dressing group. When considering the length of the initial hospital stay, the study observed that the first admission hospital stays averaged 9.10±1.91 days for all participants. A similar study conducted by Marical *et al*., [16] reported a first-admission hospital stay of 9.64±2.12 days in the silver sulfadiazine dressing group. These findings indicate a degree of consistency between the current study and previous research in terms of both escharification time and hospital stay duration. Furthermore, a study conducted in the United States of America (USA) [17] reported a time-to-hospital stay of 9.43±1.77 days in neonates treated with silver sulfadiazine. In our study, it was observed that the time to start epithelization averaged 18.90±3.60 days among neonates, a result that is consistent with findings from other research works [14, 16]. Marical *et al*., [16] reported a time to start epithelialization of 19.14±3.54 days in the silver sulfadiazine dressing group, while a similar study by Kogut and Fiore [14] found a time to hospital stay of 19.13±3.41 days in the silver sulfadiazine dressing method. Regarding the completed time to epithelization of neonates, it was found to be an average of 103.30±16.74 days in the total neonate population. These findings are also in line with results from other research works [14, 16]. Marical *et al*., [16] reported a time to complete epithelialization of 105.40±23.29 days in the silver sulfadiazine dressing group. This consistency in results across different studies reinforces the reliability of the observed outcomes in our study.

Limitation of the Study

This study faced limitations: no neonatal echocardiogram facilities hindered cardiac assessments, counseling parents on dressing was challenging, no Neonatal Intensive Care Unit restricted specialized care, and maintaining regular dressing and follow-ups was difficult. Future research with better resources is needed to improve care and data collection.

5. CONCLUSION & RECOMMENDATION

In our study exploring the use of silver sulfadiazine dressing in the non-operative management of omphaloceles, we observe a wide range of sac sizes among participants, indicating the heterogeneity of this condition. Eschar formation occurs within a reasonable timeframe, and initial hospital stays are within expected norms. Epithelization commences within a few weeks. However, the complete epithelization process is notably prolonged, emphasizing the importance of ongoing care and monitoring for these infants. Based on our findings, we recommend that medical practitioners consider the individualized care needs of omphalocele patients, particularly when determining the timing and approach for epithelization management. Additionally, further research into optimizing the epithelization process and shortening the duration of hospital stays may improve the overall care and outcomes for infants with omphaloceles.

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