



Salt Therapy Of The Umbilical Granuloma In Infants: A Prospective Study On The Effect Of The Mode Of Birth

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Background: The umbilical cord usually separates within six to eight days of birth. Umbilical granuloma (UG) may develop in the centre of the umbilicus as an inflammatory lesion after separation of the cord. In most cases, treatment was necessary. Application of salt for the treatment of UG in infants delivered by two methods was investigated.

Methods: A prospective study was performed on 32 infants with UG. Two groups of infants were implicated according to the modes of childbirth: normal vaginal delivery (NVD) and cesarean section (C-section). The UG lesion was treated by a teaspoon or half a teaspoon of salt. Treatment results were recorded for between 1 and 7 days.

Results: Most infants in the two groups were aged 15 to 27 days. Treatment with a teaspoon is more effective in solving UG than shown by half teaspoon, but without significant differences between two modes of delivery. The duration of 1-3 days was the ideal time for treating UG. There was no recurrence in a treated infant after 1 month of follow-up.

Conclusion: A teaspoon is efficient for treating UG for 1 to 3 days. There is no significant effect of the mode of birth on the treatment type. Salt therapy is simpler and does not produce any side effects

Keywords: granuloma; infant, salt; umbilical; vaginal; cesarean

Introduction

Umbilical granuloma (UG) is an inflammatory response with a moist, fleshy and pale granulating tissue developed in the centre of the umbilicus after separation of the umbilical cord [1-5]. The umbilical cord is usually separated within 6-8 days after birth and location can heal within 12-15 days [3]. A physical examination revealed a small moist, soft, painless, pinkish or red lesion in the umbilical cord which has a size of 1 to 10 mm [1, 3]. Histological examination showed that UG consists of granulation tissue with abundant fibroblasts and capillaries and has a granular surface [2, 4]. The most common

symptoms of UG are umbilical discharge, a round lump of the umbilicus with a mushroom or cherry-like mass and may produce mucus and bleeding [3-4]. Persistence of UG can develop into polyp, which is difficult to distinguish clinically [5-6]. The umbilical polyp shows deep seated hypovascular nodules with cyst formation, while the UG shows hypervascular hypoechoic solid nodules in a superficial location [7]. Promoting of UG development may be related to many factors such as infection or inadequate epithelialization of the umbilical cord stump [1]. In addition to

inflammation, delayed separation of the umbilical cord also considered a further factor predisposing the development of UG [1, 3-4]. Newborns are the age group most affected by UG, with 1 in 500 births estimated to be developing [1, 3-4]. Older children or adults may also have UG due to microbial infection or immune response to a foreign body in the umbilical, particularly in immunocompromised individuals [4].

Persistence of UG is the primary concern of parents and always requires treatment. Although there are many options available for handling or treating UG, the best option remains controversial [1]. The first choice of treatment is using silver nitrate as a topical solution (75%)[1-2, 5]. This option has a number of undesirable effects that may be related to the therapeutic nature of silver nitrate [1]. Burns of the surrounding UG skin tissue are the most common side effects of silver nitrate treatment, especially when used by an inappropriate person [1, 4, 8]. Thus, alternative applications are suggested for the management of UG such as salt application, topical steroids or antibiotics (doxycycline), ligation, antiseptics (alcohol, chlorhexidine), cryotherapy, electrocauterization and surgery excision as the last treatment choice [1-4]. The time to consider using alternative options to treat UG usually starts after the failure of 3 silver nitrate applications at an interval of 3-4 days [3, 6]. However, each of these alternative methods has many undesirable effects with inaccurate results in certain cases. Double ligation is more efficient than cauterization for the treatment of UG in newborns with less recurrence and complications and may be the best choice for treating pedunculated UG in children [2,4, 9]. Conservative management by alcohol may be suggested as the first treatment option to reduce the adverse effects of silver nitrate and any failure may then be replaced with silver nitrate [10].

Salt therapy is a promising alternative to silver nitrate and other applications [1]. This non-invasive application provides many features of advantage such as its safety, available, simple applicable without cost or side effect or recurring and does not require a physician and may be effectively performed by parents at home [8,11-20]. Studies with salt treatment require even more confirmation when some of them have not shown any significant results in comparison to other management methods. A study comparing the

application of copper sulfate and table salt for the treatment of UG in infants found that copper is more significant than salt with no differences in age, duration of symptoms and gender [21].

Application of salt for the treatment of UG in infants delivered by two methods was investigated in this prospective study.

Methods

Patients

A prospective study was conducted at the Paediatric Teaching Hospital of Karbala providence, Iraq, from October 2020 to June 2021. In total, 32 infants who were clinically diagnosed with UG in this study were included in two groups according to mode of delivery. The first group consisted of 19 infants with normal vaginal delivery (NVD) divided into 12 males (15-30 days; mean 22.5) and 7 females (19-60 days; mean 39.5). The second group included 13 infants with cesarean section (C-section) distributed between 6 males (16-60 days; mean 38) and 7 females (16-60 days; mean 38). Infants with signs of infections or sepsis were excluded from the study.

Application process

Sterilized table salt was used as a therapeutic application for UG in implicated infants. The patients were divided into two subgroups depending on the amount of salt; one was treated with a teaspoon of salt and the other with half a teaspoon. Treatment was administered in the home by parents (mostly mothers). They instructed to clean the UG lesion with a wet cotton ball and apply the determined amount of salt to the lesion, then covered with adhesive tape for 30 minutes. The tape was then removed and the area was cleaned with a moist cotton ball in warm water. The procedure was conducted once per day for 1-7 days. Patients were evaluated in the private clinic following the end of the period. Response to treatment and adverse effects were recorded and recurrence of the lesion was followed up for one month.

Statistical analysis

Data for all tests statistically analyzed with one-way ANOVA using Microsoft Excel for Windows version 10. The minimum level of $p < 0.05$ was regarded as a significant level.

Results

Infants in the NVD group that successfully treated by one teaspoon of salt were included 7 males and 3 females, while those with half a teaspoon were 5 males and 4 females. Meanwhile, infants in the C-section group were distributed between 3 males and 3 females treated with one teaspoon of salt and 6 males with one female treated with half a teaspoon. Thus, treatment with a teaspoon is more effective in solving UG than shown by half teaspoon, but without significant differences between two modes of delivery. A significant difference was observed between males and females of the NVA treated with a teaspoon and in the C-section treated with half a teaspoon of salt (Table 1 and 2).

Most infants in the two groups were aged 15 to 27 days (63.15% of NVA and 53.84% of C-section), followed by 54 to 66 days (26.31% of NVA and 23.07% of C-section) (Table 1 and 2). A large number of infants were fully cured of UG after 1-3 days, with a significant difference compared to 4-7 days (Fig. 1). One exception was found in females from two groups who treated with a teaspoon of salt that showed healing of UG after 4 to 7 days (15.78% in NVA and 30.76% of C-section). All NVA females showed a response to a teaspoon of salt after 4-7 days, while only 4 of the C-section group showed such a response. In contrast, only 3 NVA males and one of the C-section group who treated with a teaspoon demonstrated response to treatment after 4-7 days. There was no recurrence of treated lesion after one month of follow-up (Table 1 and 2).

Discussion

The UG is usually formed in the first weeks of life and disappears within two months [4]. Some UG lesions are incapable of spontaneous dissolution and cannot be prevented from developing, which means that treatment is necessary at all times [3-4]. Silver nitrate is considered commonly used for treating UG as a first option [1-2, 5]. Many disadvantages are found with applying silver nitrate, including therapeutic failure in some cases, requires a professional doctor for its application, and risk of burn the surrounding skin tissue of UG [1,3]. The area treated with silver nitrate may have hypopigmentation and hypomelanosis that may be confused with vitiligo [4]. Thus, many alternative applications are suggested at any time for the replacement of silver nitrate [1-4]. Even so, many of

these alternative applications have unacceptable characters. The application of the ligation or double ligation technique does not make it possible to treat UG with a large sessile and wide base that can bleed during the process [2]. Surgical excision usually requires a special surgeon with sterile conditions and equipment [1].

The application of salt is the most recommended choice for the replacement of silver nitrate by other methods [1]. It has numerous meaningful characteristics that are difficult to find in other applications. The most common useful characters of salt application are its availability, safety, easy to apply by non-health professionals (mostly parents), limited in cost, and do not form side effects [8, 12-20]. Based on a systemic review from 1990 to 2019, salt application gave excellent results in treating UG without adverse or recurrent effects and the cure rate was ranged from 53.33% to 100% [17]. Applying salt can be favorable to use even more than surgical excision. It was found that salt therapy in a clinical trial with infants with UG showed no significant difference between it and surgical excision, even though the surgical process was more effective [22].

Results from this study showed that treatment with a teaspoon is more effective in solving UG lesions. Most studies have not determined how much salt is used in the treatment of UG. They still used a pinch of salt to cover the full lesion of the UG [11, 15]. Other studies have used an unidentified amount of salt to treat and be contained with this salt is added to the UG lesion [13, 16]. Treatment with a teaspoon of salt was conducted in a case study of an 18-day-old woman with UG who showed a decrease in clinical symptoms of UG after 3 salt applications [12]. Age 15-27 days was the common age group among the infants in the current study. Other studies on salt treatment have been performed on newborns or infants of varying ages. Infants with UG aged 3-16 weeks or 4-20 weeks responded well to treatment with common salt [13, 15-16].

The effective duration of UG treatment in the current study was 1 to 3 days. This period was also mentioned in a study of 48 infants with UG, in which 91.7% of whom showed a perfect recovery after 3 days of treatment with common salt, but a complete healing was after 3 weeks [13]. Three days were also adequate to complete the resolution of UG in 36

infants treated with common salt [15]. The same period proved to be effective for the treatment of 211 infants with UG, but failed to treat another 7 patients [19]. Treatment of 50 infants with UG required 5 days to fully resolve disease lesion [16], while treatment of 5 cases of pyogenic granuloma required 7 to 14 days [11]. Bagadia *et al.* (2019) found that 17 infants were healed of UG after 24 hours of applying common salt [18]. This treatment period was also found to be more significant than the two-hour treatment in respect to sex, birth weight, age, and time of umbilical separation [23].

Once daily was sufficient to achieve a satisfactory therapeutic result with salt in the infants in this study. Most other studies used salt two times per day at different times. Applying common salt to 50 infants with UG twice daily for 5 days revealed full resolution of the UG lesion [16]. Of 226, 211 infants fully recovered from UG after using salt twice a day for 3 days [19]. Some cases of UG require more application frequency to completely heal which can reach 8 to 24 applications to achieve perfect healing within two weeks [20]. A single dose of an unidentified amount of salt also revealed complete resolution of UG after 24 hours [18].

No recurrence of UG lesion was observed in any of the treated infants in this study after one month of follow-up. This was also reported by other studies using salt in treating UG in infants [11, 15, 19]. After 6 months of follow-up, none of the 50 infants treated with common salt revealed a recurrence of UG [14]. In addition, recurrent, any behavior change, sleep disturbance or irritability also not found in 17 infants treated with common salt after 3 months or even during a year of follow-up [18, 20].

Adverse effect did not observed among infants of the current study. Other studies have also not identified any serious side effects or significant adverse characters, except a few undesirable characters such as a small clot like a shrunken tissue in the treated UG site that can be easily removed by gentle cleansing [15, 18]. Mild burning sensation can be experienced by some infants on the first day of salt treatment, especially in those with bleeding lesions of UG [11]. Discharge of cherry black secretion also mentioned in the first day of treatment that shrinks and heals progressively within three weeks of treatment [13]. This discharge which can take on a

reddish black color can continue during the second day of treatment and can be followed by gradual shrinkage and healing within 3 weeks [16].

The mechanism of action of salt to be effective in treating UG may be related to its physiological action. Sodium ions, which make up one of the components of salt, can extract water from skin cells, resulting in shrinkage and necrosis of granulomatous tissue [4]. Thus, the desiccant effect of salt is the secret of its therapeutic effect on UG.

In conclusion; a teaspoon is efficient for treating UG for 1 to 3 days. There is no significant effect of the mode of birth on the treatment type. Salt therapy is simpler and does not produce any side effects.

Authors' contributions: Sabah, Moatasem and Samaher contributed in design, data collection; Ali contributed in writing and materials supplied

Consent to participate: Not applicable

Consent for publication: Not applicable

Declaration of patient consent: All of the involved subjects were volunteers and signed a consent form.

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Table (1): Response of infants of normal vaginal delivery (NVD) to salt application

Gender	Amount of treatment	Treatment duration (days)	Age (days)				Total No. (%)
			15-27	28-40	41-53	54-66	
Male	Teaspoon	1-3	4* (21.05)	0	0	0	4 (21.05)
		4-7	0	0	0	3 (15.78)	3 (15.78)
	Half-teaspoon	1-3	4 (21.05)	0	0	0	4 (21.05)
		4-7	0	0	0	1 (5.26)	1 (5.26)
Female	Teaspoon	1-3	0	0	0	0	0
		4-7	1 (5.26)		1 (5.26)	1 (5.26)	3** (15.78)
	Half-teaspoon	1-3	2 (10.52)	1 (5.26)	0	0	3 (15.78)
		4-7	1 (5.26)		0	0	1 (5.26)
Total No. (%)			12 (63.15)	1 (5.26)	1 (5.26)	5 (26.31)	19

*significant difference between male and female at $p < 0.05$

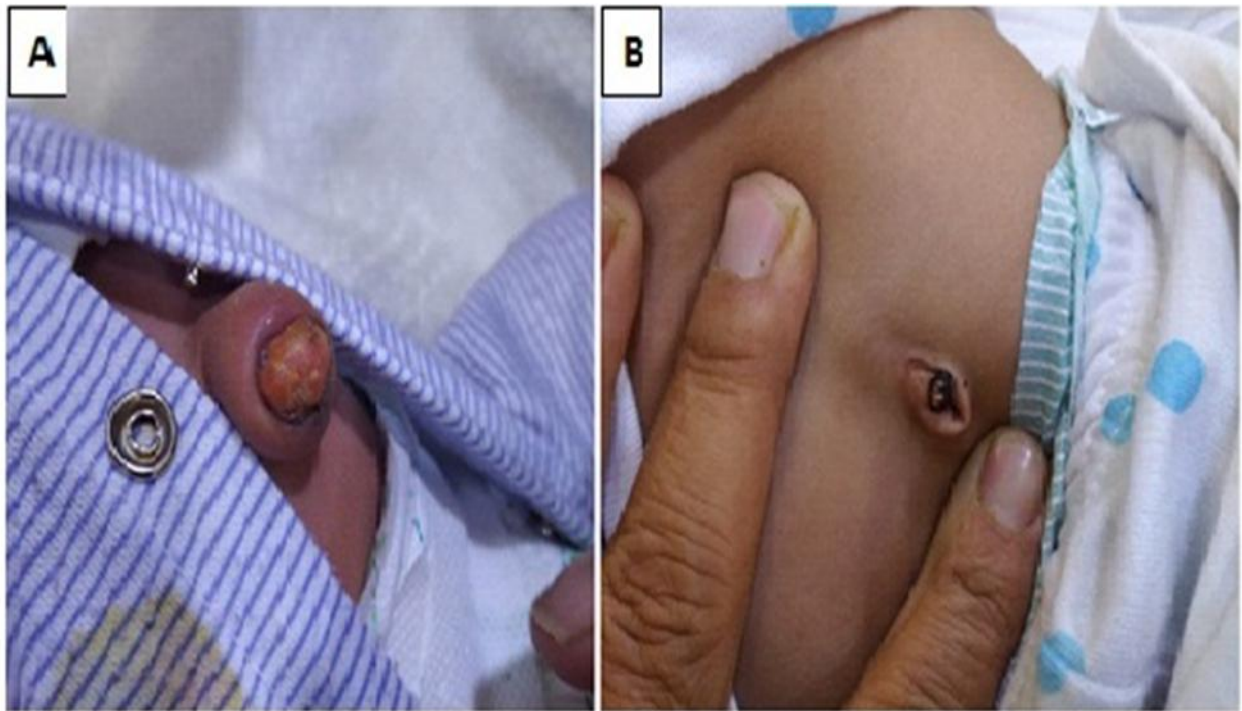
** Significant difference between therapeutic times at $p < 0.05$

Table (2): Response of infants of C-section to salt application

Gender	Amount of treatment	Treatment duration (days)	Age (days)				Total No. (%)
			15-27	28-40	41-53	54-66	
Male	Teaspoon	1-3	2 (15.38)	0	0	0	2 (15.38)
		4-7	0	1 (7.69)	0	0	1 (7.69)
	Half-teaspoon	1-3	2 (15.38)	0	0	1 (7.69)	3* (23.07)
		4-7	0	0	0	0	0
Female	Teaspoon	1-3	2 (15.38)	0	0	0	2 (15.38)
		4-7	0	1 (7.69)	1 (7.69)	2 (15.38)	4** (30.76)
	Half-teaspoon	1-3	1 (7.69)	0	0	0	1 (7.69)
		4-7	0	0	0	0	0
Total No. (%)			7 (53.84)	2 (15.38)	1 (7.69)	3 (23.07)	13

*Significant difference between teaspoon and half in females at $p < 0.05$

** Significant difference between therapeutic times at $p < 0.05$



**Fig. 1: Treatment of female with umbilical granuloma by salt for 1 to 3 days.
A: before treatment, B: after treatment**