

# Diagnosis, Treatment, and Prevention of Umbilical Granulomas Based on Current Knowledge of Their Causes and Effects

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## Abstract

**Objective:** The etiopathogenesis, diagnosis, and treatment of umbilical granulomas at MTI/LRH, Peshawar, as we know them now.

**Methods & Material:** The Umbilical Granuloma in Infants Under 24 Months of Age Study was done at MTI/LRH, Peshawar. All hospital and outpatient department (OPD) claim data from January 2019 to December 2021 were used to estimate incidence, age, sex, treatment complications, and current understanding of umbilical granuloma etiopathogenesis, diagnosis, and therapy. Umbilicus abnormalities may cause stress. Umbilicectomy. Umbilicus. Hooded umbilicuses are best—ugly umbilicuses. Umbilical surgery normalizes appearance. Umbilicoplasty Umbilical granuloma is umbilicus-base granulation tissue. Infants. Subclinical infection or umbilical cord stump epithelialization may cause granuloma—umbilical edema. Physical examination shows a small, moist, fragile, pinkish/red umbilicus lesion. Check benign soft tissue tumors for vitelline duct anomalies and urachal remnants. Debatable. Most treatments employ silver nitrate. Salt, topical antibiotics, steroids, ligation, excision, electrocautery, cryotherapy, and silver nitrate fail. Treatment-resistant people require excision. A full workup is essential if the lesion exhibits unclear clinical symptoms or does not respond to therapy.

Umbilical granulomas may occur in newborns. Parents and outpatient physicians fear umbilical granulation tissue. Spheres imply—umbilical granuloma. Umbilical granuloma treatment is restricted.

**Results:** Granulomas form when inflammation occurs in the umbilical stump. Effective double-ligature. 7–14 days. Double-ligature outperforms silver nitrate injections for pedunculated umbilical granulomas in children. Topical concentrated silver nitrate solutions or sticks treat umbilical granulomas. Peridex, alcohol (75 percent). This method may induce periumbilical chemical burns. 3–5 Umbilical exudate drying reduces chemical burns and discoloration. Lubricate umbilicus. Cryosurgery works. Umbilical granulomas seldom necessitate surgery. Umbilical granulomas are deep. Double-ligature simplifies granuloma base ligation. Povidone-iodine-washed 3-0 periumbilical silk sutures. Only fragile umbilical granulomas need 4-0 silk sutures. Stay-ligature makes double-ligature. Better second-phase lesion base ligation. Hold, then insert—enhanced ligation. The umbilical cord remnant and granuloma die and fall off after 7–14 days. This approach leaks large sessile umbilical granulomas. Larger granulomas may need numerous double-ligatures. Only large sessile umbilical granulomas with a wide base, small deep lesions, and very friable lesions that may bleed during double-ligature are contraindications. Pathology-pre-ligate.

### Conclusion:

Most umbilical granulomas may be diagnosed by a patient's medical history and a physical exam. Silver nitrate application should be suited to healthcare facilities and family compliance. First-line treatment for those with easy access to healthcare. Non-health center patients can get topical steroid therapy (clobetasol propionate 0.05% or betamethasone valerate 0.12%) twice a day for 30 days, topical antibiotics (doxycycline) once a day for 5–10 days, or basic salt application with numerous alternatives, 24-hour once, or left the agent for 30 minutes to 1 hour, repeated two times a day for 3–5 days.

**Keywords:** umbilicus, granuloma, newborn, electrocautery, cryotherapy.

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### Introduction

Umbilical granuloma in newborns is common and often causes no symptoms. Wet, meaty, pink umbilicus granulation tissue<sup>1</sup>. 2. The pedicle emits fibrin. Umbilical granulomas cause most birth abnormalities. 3. Few epidemiological research on its incidence/prevalence is reputable. Umbilical granulomas afflict 1/500 babies<sup>4</sup>. Al Siny et al. studied umbilical granulomas in 1000 healthy babies after two cord clamping surgeries. Traditional clamping caused 8% (40 patients) umbilical granulomas, whereas the second group had none (proximal clamping) <sup>6</sup>: cord clamping and hygiene impact umbilical granulomas. A little base granulation tissue mass may occur after cord separation. These 1 mm–1 cm granulomas are granulation tissue with fibroblasts and many capillaries. 7. Many pedestals. Silver nitrate and granuloma removal. Ligation, Antibiotics, Excision, Hemostatic drugs, Steroids, Electrocautery, Observation, Cryotherapy 8. Cauterization failure might induce sinus tracts or umbilical polyps—silver nitrate burns<sup>9</sup>. Umbilical granulomas form in babies<sup>10</sup>. Umbilical cord stumps dry and separate after 1–2 weeks<sup>11</sup>. The umbilicus fibromuscular ring produces skin when the cord stump splits. The cord-separated ring may have partial epithelialization and beefy red or granulation tissue with or without discharge. Wound healing may cause umbilical granuloma. Flushing infections <sup>12</sup>. The subclinical infection causes granuloma. <sup>13</sup>. Inflammation hinders stump separation, creating granuloma.

Granulation tissue may cause necrotizing fasciitis and omphalitis. Treat pathogenic granuloma<sup>14</sup>—Red, moist umbilical granulomas following cord separation<sup>15</sup>. Drying untreated granulomas may help<sup>16</sup>. Silver nitrate cures umbilical granulomas worldwide<sup>17</sup>—bad first-line silver nitrate<sup>18</sup>. Electrocautery, cryocautery, and excision are operations. All therapy has disadvantages, including recurrence<sup>19</sup>. In 1972, Schmitt offered common salt for umbilical granuloma. Kesari expanded in 1983<sup>20</sup>. Therapy texts vary. <sup>21</sup>. Salt treatment is safe and effective, but local midwives and neonatologists hesitate to provide it without supervision<sup>22</sup>. Some unresponsive cases for silver nitrate application, the need for medical professionals, the risk of periumbilical burn with chemical cauterization, some adverse effects, contraindications for bilateral ligations and its complications, lack of availability, and cost<sup>23</sup> are reasons to seek alternative management options. Silver nitrate is developing countries' cheapest umbilical granuloma treatment. Thus, the systematic review evaluates salt therapy for umbilical granuloma and makes recommendations. Salt treatment is affordable and safe in resource-poor nations. Clinical research may result. Eligibility English-language umbilical granuloma treatment research and case reports were included. Pyogenic granuloma and older children were removed.

**Methods & Material:** The Umbilical Granuloma in Infants Under 24 Months of Age Study was done at

MTI/LRH, Peshawar. All hospital and outpatient department (OPD) claim data from January 2019 to December 2021 were used to estimate incidence, age, sex, treatment complications, and current understanding of umbilical granuloma etiopathogenesis and diagnosis. The inclusion and exclusion criteria were used to choose the articles. Titles and abstracts screened articles. This systematic study sought umbilical granuloma therapy options. This research suggests the following treatment data on total granuloma/discharge resolution, lesion disappearance time, and side effects of various treatment techniques. This will tell physicians about alternative treatments and allow researchers to study the treatment's efficacy and side effects. Data were taken from each research. The research population's age, study methodology, sample size, diagnosis, country, treatment duration, response rate, side effects, and treatment area.

### **Etiopathogenesis**

Understanding the basic anatomy of the umbilical cord and how separation occurs during pregnancy might help in identifying potential causes of complications. Wharton's jelly surrounds one umbilical vein and two arteries in the umbilical cord<sup>24</sup>. The amniotic membrane surrounds these structures. Delivery clamps the umbilical cord. The chord sloughs and spontaneously separates about 7-15 days after fast desiccation/separation<sup>25</sup>. Umbilical cord persistence beyond 3–4 weeks is called delayed<sup>26</sup>. When the cord slips off, the umbilicus base heals quickly and is covered with squamous epithelium<sup>27</sup>. Occasionally, a little granulation occurs.

Tissue at the base resolves within days. Histopathologically, Umbilical granulomas are edematous stroma with fibroblasts, many tiny blood arteries, endothelium, and inflammatory cells. No neurons<sup>28</sup>. Etiopathogenesis is unknown. Granulomas arise from inflammation<sup>29</sup>. Subclinical/mild umbilical stump infections may also delay cord separation<sup>30</sup>. Inflammation causes endothelial cell expansion and poor epithelization, this idea states. The umbilical granuloma may occur for unknown reasons. They are connected to inflammation and umbilical cord delay. Bacteria may delay cord separation: infections or immunological problems (leukocyte adhesion, neutrophil motility, etc.)<sup>31</sup>. Invasion of pathogenic microorganisms by disrupting umbilical skin flora and saprophytic organisms may also influence cord separation<sup>32</sup>. Subclinical/local invasions may prevent skin epithelization and cause granulomas. Umbilical discharge and a slight navel swelling are the main symptoms. Neonatal umbilical granulomas and a comprehensive medical history show symptoms develop after cord separation—a little pinkish/yellow discharge stains the baby's underwear<sup>33</sup>. The odorless discharge should not include intestinal lumen or urine.

Umbilical discharge and belly button swelling occur when the granuloma is large or has a pedicle. The granuloma lacks nerves. Fibers it does not hurt or irritate until infected. Umbilical granulomas are tiny (1–10mm), soft/friable, nontender, and light pink/red lesions near the umbilicus<sup>34</sup>. Normal skin surrounds. Open-eyed or magnified observation reveals its granular surface. Deep umbilical pits make sessile granulomas difficult to reveal. An otoscope or surgical pick-up opens the umbilical pit to expose it in this case. Edema and hyperemia in the surrounding skin, purulent discharge, fever/hypothermia, and poor overall health may follow neglected patients exposed to inadequate sanitary circumstances.

### **Techniques for diagnosis and sub diagnosis**

Most umbilical granulomas may be detected by a comprehensive medical history and physical examination.

Granulation tissue and umbilical discharge warrant suspicion. This disease may need further testing<sup>35</sup>. Contrast tests may rule out small vitelline/urachal fistulas/sinuses with mucosal protrusion. Clinical suspicion may lead to abdominal ultrasound. Umbilical polyps with epithelium are hard to diagnose. Intestinal, stomach, and bladder polyps are bright red. Polyps and granulomas may share clinical features<sup>36</sup>. Excisional biopsy diagnoses and treats this condition. Silver nitrate may show a lesion response. Omphalitis, benign soft tissue tumors (dermoid cyst, hamartoma, hemangioma), vitelline duct anomalies, and urachal remnants are differential diagnoses<sup>37</sup>. Granulomas resemble vitelline ducts, urachus polyps, or superficial cysts. A little patent vitelline duct or urachus with minimal discharge may mimic umbilical granuloma (Table 1). Several are misdiagnosed as umbilical granuloma and treated with silver nitrate. Kondrich et al.<sup>38</sup> reported small intestinal Evisceration after cauterizing an umbilical mass, whereas MontesTapia et al.<sup>39</sup> documented an appendix-umbilical fistula with umbilical mass and drainage.

### Care And Prevention Strategies Measurements

Silver nitrate is the first-line therapy for septicemia in children and newborns (40). Despite scant data, the literature suggests management choices. These methods are explored because medical experts must administer silver nitrate, which may not work, and chemical cauterization may cause periumbilical burn<sup>41</sup>. Umbilical cord care may cause cord separation and granulomas. Drycord care works, but impoverished nations should use antiseptics<sup>42</sup>. Cord clamping may impact granulomas. Al Siny et al.<sup>43</sup> found that 24-hour umbilical cord proximal clamping avoids local infection and granuloma. Cord clamping may induce granulomas. Several therapies include silver nitrate (Table 2). Alcohol-antiseptic dressings, topical home salt or steroid treatment, suture ligation, surgical excision, electrocautery, and cryotherapy<sup>36</sup>. Some studies advocate clinical follow-up (dry care) without treatment for untreated granulomas<sup>44</sup>. Diaper folding below the umbilicus accelerates epithelization.

### Silver Nitrate Application

Internationally, umbilical granulomas are treated with silver nitrate. Antibacterial and caustic silver nitrate. Silver nitrate's medical advantages arise from these processes, although it may damage neighboring healthy tissues. Handle 100% silver nitrate pencils carefully. Chemicals may burn nearby skin<sup>45</sup>. Chemical cauterization requires sticks or Q-tips with 75% silver nitrate and 25% potassium nitrate (HemoStop™, Bray™, Grafco™, etc.). Wipe the umbilical area with disinfectant and a sterile sponge before administering silver nitrate<sup>46</sup>. Vaseline™<sup>47</sup> protects the skin. Avoid touching granulation tissue with the applicator. If the granuloma persists after 3 or 4 injections every 3-4 days, consider additional treatments<sup>48</sup>. Silver nitrate cannot cure umbilical polyps.

### Salt Application

The first evidence for salt therapy comes from low-quality trials done in third-world countries<sup>49</sup>. This pragmatic strategy yields consistent and promising clinical outcomes. Salt application is comparable across methods<sup>50</sup>. The infant does not need numerous hospital or home visits for this simple, non-invasive operation. A damp cotton pad cleans the umbilical region, then a pinch of crystal salt is placed over the granuloma. Adhesive drapes seal the granuloma. After 30 minutes, the drape is opened, ending the application process. For three days, this is

done three times. In their research, Kesaree et al.<sup>51</sup> had 100% success. In prospective research, Hossain et al. <sup>52</sup> reported that table salt treatment improved 91.7% of patients. Despite encouraging outcomes, the authors did not advocate silver nitrate therapy due to some patients' tiny burns and umbilicus discomfort. Salt application is a good alternative if no medical professional can safely administer silver nitrate.

### **Surgical Excision**

Excision of the granuloma requires sterile circumstances, a surgeon, and skill. Thus, regular usage is impractical. Excision is recommended for bigger or recurrent/intractable granulomas<sup>52</sup>. In large granulomas with extensive roots, excision and chemical cauterization of the umbilical base may be more practicable. They clamp the granuloma root and apply silver nitrate to the stump excision. Office excision may cure umbilical granulomas, according to Nagar et al. <sup>53</sup>. After excision, 302 patients received Gelfoam™ or Surgicel™. The granuloma should be histopathologically investigated after removal to exclude any embryologic (vitelline duct or urachal) remnants.

### **Different treatments**

In addition to the preceding treatments, granulomas may be treated with electrocautery, cryosurgery, double ligation, antiseptic solutions, topical steroids/antibiotics, and clinical follow-up without medication<sup>54</sup>. Small patient groups, variability, and inadequate evidence restrict these investigations. Electrocautery and cryotherapy have shown minimal success<sup>55</sup>. Both need specific clinics, which raises the expense. Cryotherapy healed faster than electrocautery and chemicals in a limited series. These treatments may darken the skin. Lotan et al.<sup>56</sup> recommended office/policlinic double ligation of pedunculated umbilical granulomas. The first ligature is pushed up during the second ligation to implant the second suture (3/0, 4/0 silk) at the granuloma base. The writers claimed functional and aesthetic success. Broad-based granulomas alone caused bleeding. This approach cannot be used on tiny granulomas if a large number is small.

Due to their friability, pedunculated granulomas may break off and bleed. Alcohol, triple dye, bacitracin, silver sulfadiazine, povidone-iodine, chlorhexidine, and hexachlorophene<sup>57</sup> have reduced umbilical stump colonization rates. Their impact on granuloma development has not been properly researched. Daniels et al.<sup>58</sup> proposed using alcoholic wipes at each diaper change and cauterizing only if conservative therapy failed. Silver nitrate and clobetasol propionate outperformed ethanol wipes in treating granulomas, according to Brodsgaard et al.<sup>59</sup>. Most preceding drugs delay cord separation and may induce granuloma<sup>59</sup>. Thus, existing data does not support the regular use of topical antiseptics/antibiotics to prevent or cure umbilical granulomas in healthy newborns. One hundred nine umbilical granuloma patients utilized topical clobetasol propionate<sup>59</sup>. The authors observed that topical clobetasol propionate was equally effective as topical silver nitrate in treating granulomas at home. Thus, clobetasol propionate cream was recommended instead of silver nitrate. Topical clobetasol propionate suppressed hypothalamic-pituitary-adrenal axis in Aydin et al. <sup>60</sup>. They recommended it for youngsters above 12.

### **Results**

According to this meta-analysis, almost all of the salt treatments for umbilical granulomas have shown great response (full cure of the granuloma/discharge) with no side impact and no recurrence in the following follow-

up of the patients. Salt in the blocked hyperosmolar chamber desiccates granuloma. After moms were instructed on how to apply cooking (common) salt, they were scheduled for follow-ups to check the result, any side effects, and recurrences. Salt cured 53.33% to 100% of trials. Except for one research that showed a 53.3% salt cure rate, others exhibited a >90% cure rate with no side effects or recurrence (Table 1). Even in patients who did not react to the first 3–5 days of salt therapy, granuloma was misdiagnosed as a polyp, and all proceeded for surgery and did well. However, extending the salt therapy to 5–10 days for patients with the right diagnosis and poor response yielded a satisfactory response without recurrence or side effects. Table 1 summarises these investigations' data.

**Table 1 The conditions to consider in the differential diagnosis of umbilical granuloma**

Urachal Remnants	Vitelline/ Omphalomesenteric	Other Umbilical Lesions
Duct Anomalies		
Fistula	Fistula	Dermoid/Epidermoid Cyst
(Patent Urachus)	(Patent Vitelline Duct)	
Sinus	Sinus	Adenoma
Cyst	Cyst	Ectopic Tissues (Pancreas, Liver)
Polyp	Polyp	Malign Tumors (Teratoma, Rhabdomyosarcoma, Fibrous Histiosarcoma)

**Table 2 Patients with umbilical granulomas may choose from various treatment options.**

Family-Based Options	Physician-Based Options
(at home)	(in a Medical Center)
Topical home salt	Silver nitrate
Topical antiseptic solutions	Ligation
Topical antibiotics	Excision ± Hemostatic materials
Topical steroids	Electrocautery
Observation (dry care)	Cryotherapy

## Conclusion

Even though there is a dearth of data about etiopathogenesis and optimal therapy for umbilical granulomas, the following suggestions may be taken from the current body of research. I) systematic medical history and physical examination can diagnose most umbilical granulomas,

II) treatment options should be individualized considering family and health center facilities, III) silver nitrate application can be considered a first-line treatment for patients who can easily access the clinic or hospital, IV) Patients who will not receive medical care in a health center can apply salt, V) If silver nitrate or table salt application fails, further workup or surgical intervention (ligation, excision) may be needed, VI) Poor hygiene and delay in medical care can lead to severe local infection (omphalitis) or sepsis.

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### Conflicts of interest

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### References:

1. Karaguzel G, Aldemir H. Umbilical granuloma: modern understanding of etiopathogenesis, diagnosis, and Management. *J Pediatr Neonatal Care*. 2016;4(3):1–5.
2. Fiaz M, Bhatti BA, Ahmed N, et al. A comparative study of the therapeutic effects of copper sulfate versus common salt (sodium chloride) in treating infantile umbilical granuloma. *Jmscr*. 2017;5(11):31127–32
3. Child Health Information. Umbilical granuloma in babies, royal united hospitals bath NHS. Foundation Trust. 2015;1–2.
4. Nathan TA. The umbilicus, granuloma. *Nelson Pediatr*. 2020;4175–76.
5. Farhat A, Mohammadzadeh A. Comparison between two and twenty-four hours salt powder in treating infant umbilical granuloma. *IRCMJ*. 2008;10(4):267–69.
6. Donnell KA, Glick PL, Caty MG. Pediatric umbilical problems, pediatric surgery for primary care pediatrics part 1. *Pediatr Clin North Am*. 1998;45(4):791–99.
7. Block SL. Stumped' by the newborn umbilical cord, practical advice for treating newborns and toddlers. *Pediatr Ann*. 2012;41(10):400–4
8. Assi NA, Kadem KM, Alrubae JR, et al. Management of umbilical granuloma. *Thi-Qar Med J*. 2010;4(4):82–87.
9. Hossain AZ, Hasan GZ, Islam KD. The therapeutic effect of common salt (table/cooking salt) on umbilical granuloma in infants. *Bangladesh J Child Health*. 2012;34(3):99–102.
10. Kesaree N, Babu PS, Banapurmath CR, et al. Umbilical granuloma. *Indian Pediatr*. 1983;20(9):690–92.
11. Hegazy AA. Anatomy and embryology of umbilicus in newborns: a review and clinical correlations. *Front Med*. 2016;10(3):271–77
12. Badebrarin D, Jamshidi M, Abadi SA, et al. A comparison between the clinical results of salt therapy and surgery in the treatment of umbilical granuloma in infants. *Iran J Pediatr Surg*. 2018;4(1):1–13.
13. Wang H, Gao Y, Duan Y, et al. Dramatic response of topical doxycycline in the umbilical granuloma. *Glob Pediatr Health*. 2015;2:1–4
14. Lotan G, Klin B, Efrati Y. Double-ligature: a treatment for pedunculated umbilical granulomas in children. *I am Fam Physician*. 2002;65(10):2067–68.
15. Whiston Hospital Children's Community Nursing Team. Salt treatment for umbilical granuloma in babies, St Helens, and Knowsley, a teaching hospital. *Paediatr Health Med Therapy*. 2018.
16. Poenaru D. Disorders of the umbilicus in infants and children: a consensus statement of the Canadian Association of Pediatric Surgeons. *Pediatr Child Health*. 2001;6(6):312–13.
17. Ogawa C, Sato Y, Suzuki C, et al. treatment with silver nitrate versus topical steroid treatment for umbilical granuloma, A non-inferiority randomized control trial. *PLoS One*. 2018;1–10.
18. Brødsgaard A, Nielsen T, Mølgaard U, et al. Treating umbilical granuloma with topical clobetasol propionate cream at home home is as effective as treating it with topical silver nitrate in the clinic. *John Wiley Sons Ltd*. 2015;104:174–77.
19. Abdullah O. Outcomes of local excision of the umbilical granuloma prior to silver nitrate cauterization. *J Klagenfurt Austria*. 2019;26(4):35–41.

20. Sanober B, Rachita S. A pinch of salt is all it takes! - The novel use of table salt effectively treats pyogenic granuloma. *J Am Acad Dermatol.* 2019;1–7.
21. Bedfordshire and Luton Joint Prescribing Committee. Community health services Bedfordshire, household salt for treatment of umbilical granuloma. Bedfordshire Health Commun Services. 2017;1–9.
22. Haftung H, Gebrehiwot T, Gidey A. Salt treatment for umbilical granuloma: effective, cheap and available alternative option of treatment. *Case Rep Pediatr Health Med Therapy.* 2020;11:393–97
23. Dhungel S, Pokhrel A, Acharya A. Outcomes and cost analysis of salt therapy versus silver nitrate for treatment of umbilical granuloma: 4-years' experience in a private health center; 4-years' experience in a private health center. *EC Pediatr.* 2018;7(7):653–59.
24. Faranoush M, Gohorbani R, Malek M, et al. Comparative study on therapeutic effect of sodium chloride and alcohol in infants with umbilical granuloma. *J Kazvin Univ MED.* 2006;10(2):65–68.
25. Bagadia J, Jaiswal S, Bhalla KB, et al. Pinch of salt: a modified technique to treat umbilical granuloma. *Natl Inst Health.* 2019;36(4):561–563.
26. Saleh AS. The therapeutic effect of common salt on umbilical granuloma in infants. *Int J Med Sci Public Health.* 2016;5(5):1–4.
27. Annapurna D, Ramu P. Therapeutic effect of copper sulfate vs. common salt (table/cooking salt) on umbilical granuloma in infants, a comparative study. *J Evol Med Dent Sci.* 2015;4(10):1616–21.
28. Pugh MB. Steadman's Medical Dictionary. (27th ed), Lippincott Williams & Wilkins, Baltimore, USA. 2000. p. 769.
29. O'Donnell KA, Glick PL, Caty MG. Pediatric umbilical problems.
30. *Pediatr Clin North Am.* 1998;45(4):791-99.
31. Rennie JM. Examination of the newborn. In: Rennie JM (Ed.), Rennie & Robertson's Textbook of Neonatology. (5th ed), Churchill Livingstone Elsevier, China. 2012. p. 254–55.
32. Nagar H. Umbilical granuloma: a new approach to an old problem. 36. *Pediatr Surg Int.* 2001;17(7):513-14.
33. Hossain AZ, Hasan GZ, Islam KD. The therapeutic effect of common salt (table/cooking salt) on umbilical granuloma in infants. *Bangladesh J Child Health.* 2010;34(3):99-102.
34. Assi AN, Kadem MK, Al Rubaee RJ, et al. Management of umbilical granuloma. *Thi-Qar Medical Journal (TQMJ).* 2010;4(4): 82-87.
35. Al Siny FI, Al Mansouri NI, Al Zahrani FS.. Proximal clamping of umbilical cord and prevention of umbilical granuloma (preliminary results). *J KAU: Med Sci.* 2004;11(1):3-7
36. Benirschke K, Burton GJ, Baergen RN. Anatomy and pathology of the umbilical cord. In: Benirschke K, et al. (Eds.) *Pathology of the Human Placenta.* (6th ed), Springer, Berlin, Germany. 2012. p. 309–75.
37. Pomeranz A. Anomalies, abnormalities, and care of the umbilicus.
38. *Pediatr Clin North Am.* 2004;51(3):819-27.
39. Rakotomalala JH, Poenaru D, Mayforth RD. Disorders of the umbilicus.
40. In: Ameh E, et al, (Eds.) *Pediatric Surgery: A Comprehensive Text for Africa.* Global HELP Organization, Seattle, USA, Ch 57. 2011. p. 53. 352–57.
41. Wilson CB, Ochs HD, Almquist J, et al. When is umbilical cord separation delayed? *J Pediatr.* 1985;107(2):292-94.
42. Stoll BJ, Kliegman RM. The Umbilicus. In: Behrman RE, Kliegman
43. RM, Jenson HB. *Nelson Textbook of Pediatrics.* (17th ed), Saunders, Philadelphia, USA. 2004. p. 608–9.
44. Brady M, Conway AB, Zaenglein AL, et al. Umbilical granuloma in a 2-month-old patient: histopathology of a common clinical entity. *Am J Dermatopathol.* 2016;38(2):133–34.
45. Lipnick RN, Eliopoulos A, Salata K, et al. Leukocyte adhesion deficiency: report of a case and review of the literature.



- Clin Exp 64. Rheumatol. 1996;14(1):95-98.
47. Mshelbwala PM, Sabiu L, Children LB, et al. Persistent umbilical discharge in infants and children. *Ann Trop Paediatr*. 2006;26(2):133-35.
  48. Hutson JM, Beasley SW. The Umbilicus. In: Hutson JM & Beasley
  49. SW (Eds.), *The Surgical Examination of Children*. (2nd ed), SpringerVerlag, Berlin, Ch 6. 2014. p. 75–82.
  50. Meltzer DI. A newborn with an umbilical mass. *I am Fam Physician*. 70. 2005;71(8):1590-92.
  51. Snyder CL. Current Management of umbilical abnormalities and related anomalies. *Semin Pediatr Surg*. 2007; 16(1):41-49.
  52. Lotan G, Klin B, Efrati Y. Double-ligature: t treatment for pedunculated umbilical granulomas in children. *I am Fam Physician*. 75. 2002;65(10):2067-68.
  53. Kondrich J, Woo T, Ginsburg HB, et al. Evisceration of small bowel after cauterization of an umbilical mass. *Pediatrics*. 2012;130(6):e1708- 78. e10.
  54. Montes-Tapia F, Garza-Luna U, Cura-Esquivel I, et al. Appendicoumbilical fistula: cause of umbilical mass with drainage. *J Pediatr*
  55. *Gastroenterol Nutr*. 2012;55(5):e133.
  56. Gaylord NM, Yetman RJ. Perinatal disorders In Burns CE, et al. (Eds.)
  57. *Pediatric Primary Care* (5th ed), Elsevier Saunders, Philadelphia, USA. 83. 2013. p. 961–99.
  58. Cilley RE. Disorders of the umbilicus. In: Coran AG, et al. (Eds.)
  59. *Pediatric Surgery* (7th edn), Elsevier-Saunders, Philadelphia, USA. 86. 2012. p. 962–72.
  60. Chamberlain JM, Gorman RL, Young GM. Silver nitrate burns following treatment for umbilical granuloma. *Pediatr Emerg Care*. 89. 1992; 8(1):29-30
  61. Derakhshan MR. Curative effect of common salt on umbilical granuloma. *Iran J Med Sci* . 1988;23(3&4):132–33.
  62. Kesaree N, Babu PS, Banapurmath CR, et al. Umbilical granuloma. 93. *Indian Pediatr*. 1983;20(9):690-92.
  63. Farhat AS, Mohammadzadeh A. Comparison between two and twenty-four hours salt powder in treating infant umbilical granuloma. *Iran Red Crescent Med J* . 2018;10(4):267–69.
  64. Sheth SS, Malpani A. The Management of umbilical granulomas with cryocautery. *Am J Dis Child*. 1990;144(2):146-47.
  65. Poenaru D (Education Committee, Canadian Association of Paediatric Surgeons). Disorders of the umbilicus in infants and children: a consensus statement of the Canadian Association of Paediatric Surgeons.
  66. *Paediatr Child Health*. 2001;6(6):312-13.
  67. Brodsgaard B, Nielsen T, Molgaard U, et al. Treating umbilical granuloma with topical clobetasol propionate cream at home home is as effective as treating it with topical silver nitrate in the clinic. *Acta 105. Paediatr*. 2015;104(2):174-177.
  68. Daniels J, Craig F, Wajed R, et al. Umbilical granulomas: a randomized controlled trial. *Arch Dis Child Fetal Neonatal Ed*. 2003;88(3):F257.
  69. Sharma CM, Aggarwal B, Chaudhary P. Role of common salt in treating umbilical cord granuloma. *Int J Contemp Pediatr*. 2020;7(7):1478.
  70. Bagadia J, Jaiswal S, Bhalla KB, Poojary S. Pinch of salt: A modified technique to treat umbilical granuloma. *Pediatr Dermatol*. 2019;36:561–63