

Original Research Article

Analysis of factors affecting outcome in pediatric omphalitis

Shalika Jayaswal, Hemanshi Shah*, Vikrant Kumbhar

Department of Paediatric Surgery, Nair Hospital, Mumbai 400008, Maharashtra, India

Received: 27 August 2016

Revised: 13 September 2016

Accepted: 24 September 2016

***Correspondence:**

Dr. Hemanshi Shah,

E-mail: hemanshishah@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Omphalitis is inflammation of the umbilical cord stump. Omphalitis contributes to neonatal morbidity and mortality.

Methods: A prospective study of retrospective data of 25 children with umbilical swelling, redness and discharge was analyzed for age of presentation, home delivery versus institutional delivery, cord clamping and cutting practices, local applications, microbiological swab, management and complications.

Results: Common symptoms were umbilical swelling, erythema and sero-purulent discharge. Four neonates had a home delivery. Most common organism isolated was *Staphylococcus aureus*. 14 patients responded to intravenous antibiotics and daily dressing. 11 patients required surgical intervention.

Conclusions: Institutional delivery, cord cutting and cord care practices reduces the frequency of omphalitis. Uncomplicated omphalitis resolves without significant morbidity. Early diagnosis and treatment reduces the risk of complications.

Keywords: Children, Neonate, Omphalitis

INTRODUCTION

Omphalitis is common in underdeveloped and developing countries. It is related to home deliveries and inappropriate postnatal cord care. Omphalitis starts with local inflammatory changes and infected collections but can progress to severe complications like necrotizing fasciitis, intraperitoneal abscess with or without peritonitis and portal vein thrombosis.¹ Prompt management is necessary to avoid morbidity and mortality.

METHODS

A prospective study of retrospective data of 25 patients was done in a tertiary care institute from June 2012 to June 2016 to analyse the epidemiological factors affecting outcome of omphalitis in children.

All patients with umbilical swelling, periumbilical erythema and serosanguinous discharge were included in the study. Patients with urinary or faecal discharge from the umbilicus suggestive of patent urachus or vitello-intestinal duct were excluded from the study. Data regarding age of presentation, home delivery versus institutional delivery, cord clamping and cutting practices, cord care, cord fall off time, presenting symptoms, microbiological swab in patients with discharge, management and complications were recorded for analysis.

All patients were admitted. Purulent or serous discharge if any was sent for culture sensitivity. The umbilicus was cleansed thoroughly. All patients were started on antibiotics covering both gram positive and gram negative organisms. Combination of amoxicillin with clavulanic acid with metronidazole was administered. Preperitoneal pus collections, intraperitoneal abscesses

and hepatic abscesses were ruled out by abdominal sonography.

Operative intervention in the form of incision and drainage was done for patients with localized collections. Anatomical lesions of the umbilicus underwent excision.

RESULTS

The youngest patient was a 9 day neonate and the eldest patient was 7 years old. Eleven patients presented in the neonatal period, 8 presented between one month and one year and 6 patients were more than one year of age. Fourteen were males and eleven were females.

4 out of the 11 neonates had undergone a home delivery where the cord was tied with a linen thread and cut with a fresh razor blade. This was followed by traditional postnatal cord care practices. A sterile plastic disposable cord clamp followed by dry cord care was used for the 7 neonates who had an institutional delivery. The cord fall off time ranged between 3-14 days for both the groups.

Presenting symptoms were umbilical swelling in 20 patients, foul smelling serous discharge in 13, pus discharge in 9 and periumbilical erythema in 5 patients. Three patients with delayed presentation had associated complications. One neonate presented with intestinal obstruction, another three month old presented with maggots in the umbilicus and another 3 month infant had an associated liver abscess. Systemic signs like fever, tachycardia and tachypnea were present in 10 patients. No patient presented with necrotizing fasciitis or septic shock.

Microbiological swab was sent for aerobic and anaerobic cultures in 22 patients. Most common organism isolated was *Staphylococcus aureus* in 10, Methicillin Resistant *Staphylococcus aureus* in 4, *Streptococcus pyogenus* in 3 and *Klebsiella* in 2 patients. No organism was grown in three patients.

X ray showed evidence of intestinal obstruction in one neonate. One patient with a delayed presentation had a hepatic abscess of 3 X 4cm in the left lobe of liver. Five patients were suspected to have a patent urachus on sonography. Micturating cystourethrogram was normal.

14 (8 neonates) patients responded to intravenous antibiotics and local cleansing. Turpentine dressing was used to treat maggots. The hepatic abscess resolved with administration of intravenous antibiotics. Eleven patients needed surgical intervention. Incision and drainage was done in 6 cases (four infants). 3 patients underwent ligation of umbilical granuloma after resolution of the active infection. One patient with an umbilical sinus underwent excision. One neonate with intestinal obstruction secondary to adhesive obstruction of jejunum to under surface of umbilicus underwent laparotomy.

Table 1: Age and mode of intervention.

Age	Surgical intervention (n = 11)	Response to antibiotic therapy (n = 14)
0 - 1 month (n = 11)	3	8
1 month - 1 year (n = 8)	4	4
Above 1 year (n = 6)	4	2

DISCUSSION

Infections are responsible for 36% of neonatal mortality worldwide and neonatal sepsis may stem from local umbilical cord infections which may become systemic.² Other causes of neonatal sepsis are septicemia, meningitis, pneumonia, arthritis, osteomyelitis and urinary tract infection of the new-born.

Omphalitis is an inflammation of the umbilical cord stump.³ After an infant is born, the umbilical cord is cut leaving behind a small remnant called stump. The umbilical cord sloughs off within 2 weeks after birth. Delayed separation after more than 1 month, is associated with neutrophil chemotactic defects (Chediak-Higashi syndrome) and severe bacterial infections.¹

Incidence of omphalitis in developing countries varies from 2 to 7 for 100 live births as compared to incidence in the developed countries which falls between 0.2-0.7percent.¹

Although there is a male preponderance, there does not appear to be a racial or ethnic predilection to developing omphalitis. The mean age of onset is usually 3-5 days for preterm infants and 5-9 days for term infants. For those with complications, the age at presentation is 5-75 days (median, 33 days).¹ Omphalitis is a disease of infancy and rarely presents in adulthood.⁵ The causes in adults are folliculitis, infections, piercings; lint ball omphalitis, pilonidal cysts etc.; rarely remnants of allantois or a patent vitello-intestinal duct can be cause of omphalitis in adults.⁶

Home delivers especially where a skilled and trained worker is not available may be accompanied with unsterile practices. This usually occurs in tribal areas. According to ministry of health and family welfare statistics, Government of India in 2011, the institutional deliveries to total deliveries increased from 56.7% in 2006-07 to 78.5% in 2010-11.⁷ The statistics shows a gradual increase in the number of institutional deliveries wherein antisepsis is strictly adhered to. Government of India has introduced different schemes with focus of promotion of institutional deliveries thereby decreasing neonatal sepsis and morbidity. In another study by Savardekar et al, the incidence of neonatal omphalitis decreased with the decline in home births.⁸

Factors which lead to omphalitis are cord cutting using unclean non sterile razor blades, not washing hands before and after handling the baby.⁹ For home deliveries, cord was cut with non-sterile razor blades. Local cord care practices in developing countries included application of charcoal, baby powder, dust, Vaseline, mustard oil, breast milk, cow dung and chicken feces.¹⁰

The recent trends have moved back to dry cord care, without routine application of topical antiseptic agents. These trends have been accepted by American Academy of Pediatrics.¹¹ The World Health Organisation currently also recommends dry cord care.¹² This trend of dry cord care in developed countries is supported by systematic reviews.¹³

The exception in developed countries is after home delivery where application of antiseptic agent to the umbilical cord stump is indicated.¹⁴ The WHO recommends application of chlorhexidine to the umbilical cord stump during the first week of life for those born at home in regions with neonatal mortality rate more than 30 neonatal deaths per 1000 live births.¹² The application of chlorhexidine to the umbilical stump not only reduces the incidence of umbilical stump infections and also overall neonatal mortality.¹⁴ In three studies conducted in South Asia, application of 4% chlorhexidine to umbilical cord of new-born leads to reduction in omphalitis. Maximum protective effect of chlorhexidine occurs in first week of life, but remains significant throughout the neonatal period.¹⁵

In a study conducted in South East Asia comparing the chlorhexidine group to dry cord care group, cord separation time was longer in the former in two countries. However, there was no difference in the time of separation of the cord in another.¹⁵ Overall, mixed results were reported with use of chlorhexidine and silver sulfadiazine prolonging the time of cord separation whereas others like breast milk and alcohol shortened it.¹⁶ Yet another practice of applying human milk to umbilical stump has no adverse effect and is associated with shorter cord separation time.¹⁷ However, the cord separation time has no effect on the incidence of omphalitis, as evidenced by H Ozdemir et al in a study of 514 neonates with omphalitis. They concluded that there was no relationship between umbilical cord separation time and incidence of umbilical cord infection.¹⁸

Presenting signs and symptoms are redness, swelling, serosanguinous discharge, pain, fever, tachycardia, somnolence, poor feeding and hypotension. Locally extensive disease is indicated by superficial cellulitis that can spread to involve the entire abdominal wall and may progress to necrotizing fasciitis and myonecrosis.² Systemic involvement of the gastrointestinal system may be in the form of abdominal distension with or without absent bowel sounds.⁴

About three fourths of cases of omphalitis are polymicrobial in origin, predominated by *Staphylococcus aureus*, group A streptococcus, *Escherichia coli*, *Klebsiella pneumonia*, and *Proteus mirabilis*.¹⁹ In our experience with omphalitis, *Staphylococcus aureus* was the common organism grown from cultures of umbilical discharge.

Complications of omphalitis include respiratory failure, hypotension and disseminated intravascular coagulation arising from infection. Necrotizing fasciitis is the most commonly reported serious complication of omphalitis. Umbilical hernia is a common problem in children and is a consequence of weakening of the umbilical cicatrix from neonatal omphalitis.⁴

Peritonitis may occur with or without intraperitoneal abscess collection. Hepatic abscess should be localized by ultrasound.⁴ Portal vein thrombosis is a complication with serious consequences. In one report of 200 patients who had undergone portosystemic shunt for portal hypertension due to portal vein thrombosis, 15% of the portal vein thrombosis was suspected to be the result of neonatal omphalitis.²⁰ Among the late complications are the peritoneal adhesions as a result of previous peritonitis following omphalitis. Adhesions may produce intestinal obstruction or intestinal myonecrosis.

CONCLUSION

Omphalitis contributes to neonatal morbidity and mortality. In developing and in underdeveloped countries, adequate post-delivery cord care significantly reduces the frequency of omphalitis. Uncomplicated omphalitis usually resolves without significant morbidity.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Bugaje MA, McHoney M, Ameh EA, Lakhoo K. Omphalitis. In: Emmanuel A, Stephen, W. Bickler, Kokila Lakhoo, Benedict c n worn, Dam Poenaru, eds. Paediatric Surgery: A Comprehensive Text For Africa. Vol 1. Africa: Global help; 2010:124-128. Available at http://www.Global-help.org/publications/books/help_pedsurgeryafricavolume01.pdf. Accessed on 15 July 2016.
2. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: When? Where? Why? The Lancet. 2005;365:891-900.
3. Gallagher PG. Ted Rosenkrantz, MD more. Omphalitis. Medscape Reference, Drugs Diseases and Procedures Updated; 2016.
4. Kliegman, Stanton, St Geme, Schor. Nelson Text book of Pediatrics 20th edition Chapter No. 105 The Umbilicus; 2015:890.

5. Carney WI, May GA. Omphalitis in the adult. *Arch Surg.* 1973;106(2):229-30.
6. Kasiakou SK, Rafailidis PI, Rosmarakis ES, Falagas ME. Recurrent omphalitis in adults. *Scand J Gastroenterol.* 2004;39(10):1021-4.
7. Family welfare statistics in India. Statistics division, Ministry of Health and Family Welfare, Government of India. 2011. Available at <http://mohfw.nic.in/WriteReadData/I892s/3503492088FW%20Statistics%202011%20Revised%2031%2010%2011.pdf>. Accessed on 26 July 2016.
8. Sawardekar KP. Changing spectrum of neonatal omphalitis. *Pediatr Infect Dis J.* 2004;23(1):22-6.
9. Mullany LC, Darmstadt GI, Tielsch JM. Role of antimicrobial applications to the umbilical cord in neonates to prevent bacterial colonization and infection: a review of the evidence. *Pediatr Infect Dis J.* 2003;22(11):996-1002.
10. Herlihy JM, Shaikh A, Mazimba A, Gagne N, Grogan C, Mpamba C, et al. Local perceptions, cultural beliefs and practices that shape umbilical cord care: a qualitative study in southern province, Zambia. *PLoS One.* 2013;8(11):e79191.
11. Care of the new-born. In: Riley LE, Stark AR, eds. *Guidelines for Perinatal Care.* 7th ed. Elk Grove Village, IL and Washington, DC: American Academy of Pediatrics and American College of Obstetricians and Gynecologists; 2012:285-6. Available at <https://evidencebasedpractice.osumc.edu/Documents/Guidelines/GuidelinesforPerinatalCare.pdf>. Accessed on 15 July 2016.
12. Recommendations on new-born health. Guidelines on maternal, new-born, child and adolescent health. Available at [http://www.who.int/maternal_](http://www.who.int/maternal_child_adolescent/documents/guidelines-recommendations-newborn-health.pdf)
[child_adolescent/documents/guidelines-recommendations-newborn-health.pdf](http://www.who.int/maternal_child_adolescent/documents/guidelines-recommendations-newborn-health.pdf). Accessed on 15 July 2016.
13. Imdad A, Bautista RMM, Senen KAA, Uy MEV, Mantaring III JB, Bhutta ZA. Umbilical cord antiseptics for preventing sepsis and death among newborns. *Cochrane Database Syst Rev.* 2013;(5):CD008635.
14. Goldenberg RL, McClure EM, Saleem S. A review of studies with chlorhexidine applied directly to the umbilical cord. *Am J Perinatol.* 2013;30(8):699-701.
15. Imdad A, Mullany LC, Baqui AH, El Arifeen S, Tiersch JM, Khatry SK. The effect of umbilical cord cleansing with chlorhexidine on omphalitis and neonatal mortality in community settings in developing countries: a meta-analysis. *BMC Public Health.* 2013;13(3):S15.
16. Karumbi J, Mulaku M, Aluvaala J, English M, Opiyo N. Topical umbilical cord care for prevention of infection and neonatal mortality. *Pediatr Infect Dis J.* 2013;32(1):78-83.
17. Vural G, Kisa S. Umbilical cord care: a pilot study comparing topical human milk, povidone-iodine, and dry care. *J Obstet Gynecol Neonatal Nurs.* 2006;35(1):123-8.
18. Ozdemir H, Bilgen H, Coskun S, Topuzoglu A. Does cord separation time has an effect on omphalitis? *Arch Dis Child.* 2012;97:A367.
19. Airede AI. Pathogens in neonatal omphalitis. *J Trop Pediatr.* 1992;38(3):129-31.
20. Orloff MJ, Orloff MS, Girard B, Orloff SL. Bleeding esophageal varices from extrahepatic portal hypertension: 40 years' experience with portal-systemic shunt. *J Am Coll Surg.* 2002;194:717-30.

Cite this article as: Jayaswal S, Shah H, Kumbhar V. Analysis of factors affecting outcome in pediatric omphalitis. *Int Surg J* 2016;3:1929-32.