

Temporary diverting end-colostomy in critically ill children with severe perianal wound infection

ABSTRACT

Broad and deep perianal wounds are challenging in both adult and pediatric ICUs. These wounds, if contaminated with gastrointestinal flora, can cause invasive sepsis and death, and recovery can be prolonged. Controlling the source of infection without diverting stool from the perianal region is complicated. The option of protective colostomy is not well-known among pediatric critical care specialists, but it can help patients survive extremely complicated critical care management.

These authors present three critically ill children who required temporary protective colostomy for perianal wounds because of various clinical conditions. Two patients were treated for meningococemia, and the other had a total artificial heart implantation for dilated cardiomyopathy. There was extensive and profound tissue loss in the perianal region in the patients with meningococemia, and the patient with cardiomyopathy had a large pressure injury. Timely, transient, protective colostomy was beneficial in these cases and facilitated the recovery of the perianal wounds. Temporary diverting colostomy should be considered as early as possible to prevent fecal transmission and accelerate perianal wound healing in children unresponsive to local debridement and critical care.

Keywords colostomy, diverting colostomy, meningococemia, pediatric, perianal

For referencing Gün E et al. Temporary diverting end-colostomy in critically ill children with severe perianal wound infection. WCET® Journal 2021;41(3):38-43

DOI <https://doi.org/10.33235/wcet.41.3.38-43>

Submitted 24 June 2020, Accepted 25 September 2020

Emrah Gün*▼MD

Fellow, Department of Pediatric Critical Care Medicine

Tanıl Kendirli ▼MD

Professor, Department of Pediatric Critical Care Medicine

Edin Botan ▼MD

Fellow, Department of Pediatric Critical Care Medicine

Halil Özdemir ▼MD

Associate Professor, Department of Pediatric Infectious Disease

Ergin Çiftçi ▼MD

Professor, Department of Pediatric Infectious Disease

Kübra Konca ▼MD

Fellow, Department of Pediatric Infectious Disease

Meltem Koloğlu ▼MD

Professor, Department of Pediatric Surgery

Gülner Göllü ▼MD

Associate Professor, Department of Pediatric Surgery

Özlem Selvi Can ▼MD

Associate Professor, Department of Pediatric Anesthesia

Ercan Tutar ▼MD

Professor, Department of Pediatric Cardiology

INTRODUCTION

Open perianal wounds are challenging problems in ICUs, especially in morbidly obese adult patients because of poor tissue circulation, pressure-related tissue necrosis, and insufficient or inconsistent position changes. This problem is seen in paediatric ICUs (PICUs) less frequently than in adult ICUs. However, in paediatric patients, perianal wounds can be fatal. Open perianal wounds may lead to sepsis as a result of uncontrolled infection after contamination with gastrointestinal flora. Perianal sepsis is associated with a high mortality of up to 78%.¹ The most common infections in neutropenic patients with perianal sepsis are caused by *Escherichia coli* and *Enterococcus*, *Bacteroides*, and *Klebsiella* species.² This concept is well-known, but there are only a few reports about how to control it, especially in PICUs.

Ahmet Rüçhan Akar ▼MD

Professor, Department of Cardiovascular Surgery
Heart Centre, Cebeci Hospitals

Erdal İnce ▼MD

Professor, Department of Pediatric Infectious Disease

* Corresponding author

▼Ankara University School of Medicine, Turkey

A temporary diverting colostomy can be used to keep feces out of the colon and off of skin that is inflamed, diseased, infected, or newly emerging. The procedure provides time for healing. Whether to perform a colostomy is still controversial; there are no consensus guidelines describing indications for and appropriate timing of colostomy.³ In addition, even though there is little information about the management of perineal burns and faecal diversion strategies in the literature, colostomy is generally recommended to prevent faecal contamination.⁴ Diverting colostomy remains the most common procedure in children when stool diversion is indicated.⁵

Meningococemia is a severe infection in children associated with high mortality and significant morbidity if it is not treated efficiently and quickly. Occasionally, meningococemia is seen as a severe form known as purpura fulminans (PF). Correct and timely management of PF is critical. Although there are several reports regarding the management of a patient with PF and severe tissue loss,^{6,7} no report describes how to control open perianal and gluteal wounds from the PF form of meningococemia.

Here, the authors describe the cases of three critically ill children with extensive perianal tissue loss. Their cases invite a discussion about the timing of diverting colostomy, its duration, and associated outcomes. To the best of the authors' knowledge, temporary diverting colostomy has not previously been considered in the management of PF.

Written informed consent to reprint the case details and associated images was obtained from each patient's family. All demographic features and clinical courses are reported in the Table.

CASE 1

A 4-month-old girl was transferred to the authors' PICU from another hospital because of fever and widespread petechial and purpuric rashes with suspicion of meningococemia. She had extensive hemorrhagic purpuric lesions on her body and findings of decompensated septic shock (Figure 1A). The patient required intubation and invasive mechanical ventilation. Ceftriaxone, inotropic support, and hydrocortisone commenced. Laboratory workup showed severe metabolic acidemia, electrolyte imbalance, elevated acute phase reactants, and impaired coagulation parameters. Her blood culture showed *Neisseria meningitidis*, but not in cerebrospinal fluid sample. During the follow-up, the patient underwent seven plasma exchange (PEX) sessions because of thrombocytopenia-associated multiorgan failure and continuous venovenous hemodialysis from fluid overload and sepsis for 6 days. Antibiotics were revised according to culture antibiograms during hospitalisation.

The patient was extubated on the 15th day of hospitalisation. *Acinetobacter baumannii* was isolated from necrotising wound culture in the perianal region. The patient developed septic shock, which was treated with fluid boluses, epinephrine, meropenem, and colistin. The interdisciplinary team decided to proceed with colostomy given that the patient had extensive infected necrotising perianal wounds, and preventing stool and gastrointestinal flora from coming into contact with deep open wounds was crucial for wound healing and treatment of sepsis (Figure 1B). A temporary diverting colostomy was performed on the 30th day of PICU admission without any surgical complication.

The patient's open wounds were healed in a short time after colostomy, and she could eat on the 35th day of PICU



Figure 1, case 1. A, A 4-month-old girl presented with fever and widespread petechial and purpuric rashes, with suspicion of meningococemia. Extensive ecchymosis and purpuric lesions were noted on the face, body, extremities, and perineal region. B, Before temporary diverting colostomy, deep and large necrotizing wounds in the perianal region and lower extremities are noted. C, This photograph was taken on the 35th day of pediatric ICU admission with the healing of the necrotizing perianal wound after diverting colostomy.

admission. She was transferred to paediatric infectious diseases (PIDs) service without any oxygen therapy or antibiotics, and her colostomy was taken down in the fifth month of hospital admission after all of her open perianal wounds were healed (Figure 1C).

Currently, the patient is 20 months old, her mental findings are positive, and she can walk. However, she lost the distal parts of her hand and feet after autoamputation because of severe ischemic changes related to meningococemia, and the skin of her right leg and foot is also compromised.

CASE 2

A previously healthy 8-month-old girl was admitted to the authors' hospital with a diagnosis of meningococemia. As in the first case, the patient had petechial and purpuric lesions all over her body (Figure 2A). On presentation, she had decompensated septic shock findings, which were treated with fluid boluses, antibiotics, inotropes, vasopressors, and hydrocortisone. She was intubated and received respiratory support from a mechanical ventilator. The authors performed eight PEX sessions for thrombocytopenia-associated

multiorgan failure. Her femoral pulses on the left leg were palpable, but Doppler ultrasound revealed no flow on the left popliteal artery. Her blood culture was positive for *N meningitidis*, as was the cerebrospinal fluid. Broad-spectrum antibiotics were given to combat the facility-acquired infections during hospitalisation.

She had a diverting colostomy on the 23rd day of PICU admission to prevent extensive necrotising perianal wounds from contamination with stool (Figure 2B). After the colostomy, her clinical situation improved, infection abated, and the open and deep wounds improved in a short time. The patient was extubated on the 27th day of hospitalisation. She was transferred to the PID clinic for further care of her open wounds on the 38th day of PICU admission. She was discharged from hospital 83 days after her transfer to the PID service with fully healed perineal wounds and scheduled to have her colostomy closed. Unfortunately, her distal limbs did not improve, and she experienced an amputation (Figure 2C).

CASE 3

A 15-year-old boy was admitted to the authors' PICU with

Table 1 participant characteristics.

No	Age	Sex	Diagnosis	Length of Stay, d	Day of Operation	Negative-Pressure Wound Therapy	Day of Closure	Outcome
1	4 mos	Female	Meningococemia	109	40	Yes	150	Healed
2	8 mos	Female	Meningococemia	38	23	No	-	Healed
3	15 y	Male	Total artificial heart implanted Cardiomyopathy	605	58	Yes	300	Healed



Figure 2, case 2. A, An 8-month-old girl presented with meningococemia. Petechial and purpuric lesions all over her body were clearly noted. B, Severe perineal unstageable ulcers were contaminated with stool. C, Rapid healing after diverting colostomy operation.

decompensated biventricular heart failure and persistent ventricular arrhythmias. He was supported by emergency peripheral venoarterial extracorporeal membrane oxygenation. He had a history of left ventricular thrombus removal operation 2 months prior at a different facility. He also had renal and liver failure.

After hemodynamic evaluation and interdisciplinary discussions, he received a 50-mL total artificial heart (TAH; SynCardia Systems LLC, Tucson, Arizona), implanted by the hospital's transplantation team. During the postoperative period, he experienced ventilator-associated pneumonia and sepsis associated with pan-drug-resistant *Klebsiella pneumoniae* and developed multiple organ failure. He received supportive therapy including venovenous hemodiafiltration for 35 days and 22 PEX sessions. He underwent percutaneous tracheostomy on his 41st postoperative day; during this time, there were no TAH-related complications, and his clinical condition improved slowly.

Earlier, during the third week of his PICU admission, and despite frequent position changes, he developed an unstageable pressure ulcer⁸ (UPU; Figure 3A) because of his lengthy illness, circulatory failure, and septic attacks. This sacral UPU was unresponsive to local care and deteriorated. Deep-tissue biopsy cultures confirmed the presence of methicillin-resistant *Staphylococcus aureus* and pan-drug-resistant *K pneumoniae*. Accordingly, the decision to proceed with a temporary protective colostomy was made to eradicate the source of septic attacks and keep the patient on the heart transplant list. He had a sigmoid colostomy process on his 58th day of hospitalisation. Following colostomy and debridement of his UPU, negative-pressure wound therapy was applied, and the UPU healed after his transfer to PID.

Independent ambulation of the patient was achieved in the sixth month of PICU admission with an intensive physical therapy and rehabilitation program. Following independent ambulation, the patient's hepatic and renal failure was resolved, and he was listed for heart transplantation. The patient's colostomy was taken down in his 10th month of hospitalisation. He was successfully bridged to transplant by TAH and supportive care, but unfortunately, he died after the transplantation.

DISCUSSION

Perianal wounds often lead to sepsis in critically ill children, who are particularly susceptible to skin infections. Perianal skin lesions may cause significant problems, such as skin and soft-tissue necrosis and scarring extending to the sphincter apparatus, which can cause lifelong incontinence. Treatments include antimicrobial therapy, extensive debridement, and skin graft.³

There are few reports regarding perianal sepsis management.¹ Temporary colostomy should be considered in patients unresponsive to local care and surgical debridement. Colostomy facilitates wound healing by keeping feces out of the colon and off of inflamed, diseased, infected, or newly emerging skin. Performing a colostomy is controversial, and there are no consensus guidelines describing appropriate indications or timing of colostomy.³

However, paediatric surgeons are familiar with the colostomy procedure, given that it is required in children with anorectal malformations (especially rectourethral or rectovesical neck fistulas), long-segment Hirschsprung disease, or Crohn disease; in cases of perineal trauma; or in patients presenting with rectosigmoid perforation. Complications of an adequately performed colostomy are infrequent in children. The most common early complications are skin irritation, poor stoma



Figure 3, case 3. A, A 15-year-old boy who underwent total artificial heart implantation developed deep and unstageable pressure ulcers on the sacrococcygeal region and local sepsis. B, Sigmoid colostomy, repeated debridement, and negative-pressure wound therapy resulted in the improvement of the large pressure injury, which allowed the patient to bridge to heart transplantation.

location, and local necrosis, and the most common late complications are skin irritation, prolapse, and stenosis.⁴ There were no colostomy-related complications in these three cases.

Temporary, protective, diverting colostomy and its takedown are technically accessible, fast, and comparatively safe procedures in children. Therefore, these authors suggest that there is no basis to avoid colostomy when there is a potentially life-threatening perianal infected wound, and local debridement and wound care are not sufficient for proper wound healing. The other important point is that the colostomy completely diverts stool from the perianal region. Loop colostomies are not suitable for these patients, and diverting colostomies are needed.

Even though there are only a few reports on the management of perineal burns and faecal diversion strategies, the colostomy is generally recommended to prevent faecal contamination. Perianal burns are necessarily exposed to faecal contamination.⁴ This may cause sepsis and graft loss, contaminate wounds, delay wound healing, and lead to scar contracture or anal and urinary malfunction.^{4,9} Diverting colostomy in children remains the procedure of choice when stool diversion is indicated.⁵

Quarmbly et al¹⁰ reported a successful series of colostomies in 13 paediatric patients with perineal burns; wound healing was achieved in 12 patients. Price et al⁹ performed protective colostomies in 29 children with perianal burns on day 6 after admission and therapeutic colostomies in 16 patients with deep wound infection and sepsis on day 24. In all cases, they achieved marked improvement and healing of the perianal burn wounds, although two patients died of septic shock. Five (11%) of their patients had complications related to the colostomies such as dehiscence and stomal protrusion requiring manual reduction.⁹

There may be extensive necrotising perianal wounds in patients with meningococemia, as seen in this patient series. In this population, colostomy may be required to prevent local and systemic infections. Fulminant meningococemia is a relatively rare, life-threatening disease induced by *N meningitidis*. It may cause a fatal form of septic shock, and most deaths occur within the first 24 hours. It is distinct from other forms of septic shock, mostly because of the appearance of hemorrhagic skin lesions.⁷ Meningococemia is one of the precursors to PF, which is characterised by widespread hemorrhagic skin necrosis from vascular thrombosis. Extensive purpuric necrosis may develop in the extremities and cause amputation. When peripheral gangrene occurs, amputation is indicated because this condition itself can induce sepsis.⁶

These patients had gangrenous areas and deep clefts in the perineal region and lower extremity. Colostomy was performed in these patients to prevent contamination with feces and perianal wound-induced sepsis. As far as the authors are aware, there are no previously reported cases with meningococemia who underwent colostomy to prevent perianal sepsis.

The beneficial effects of temporary protective diverting colostomy include controlling local and systemic sepsis, reducing colonisation and spread of multidrug-resistant bacteria, and decreasing multiple drug exposure. These effects may lead to rapid healing of open perianal wounds, restricting catabolic state, and weight loss with quicker healing. The patients may be discharged from PICU in a relatively shorter time.^{3,7} Before colostomy was performed in these three cases, irrigation with normal saline, a thin layer of antibacterial ointment such as mupirocin, and an antiseptic dressing were used as local wound care. Negative-pressure wound therapy was given to two patients after colostomy. The authors noted all the beneficial effects of diverting colostomy in these patients. The decision to proceed with colostomy was made in the early period of PICU admission. Therefore, the authors did not note any multidrug-resistant bacteria colonisation and septic attacks related to these bacteria.

The providers in the authors' facility discuss every new development, good or bad, with PICU parents daily and carefully discuss all possible outcomes. Generally, families are prepared for possible deterioration in patient status. However, the families of all three patients were very pleased that there was no increase in wound infections at the end of this difficult process.

CONCLUSIONS

Temporary diverting colostomy has many benefits for treating perianal wound infection, septic attacks, and tissue destruction by preventing faecal contamination in critically ill children with large open perineal wounds. Although this clinical condition is not rare, protective colostomy is not well-known among paediatric critical care specialists. These authors believe that this intervention helped these patients to stay alive during their extremely complicated critical care management. Consequently, temporary protective diverting colostomy should be considered as early as possible to prevent faecal transmission and accelerate wound healing in children requiring critical care with large perianal wounds that are not responsive to local debridement and care.

ACKNOWLEDGMENTS

The authors wish to thank all the paediatric ICU nursing staff for all their efforts and support for our critically ill paediatric patients.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

FUNDING

The authors received no funding for this study.

REFERENCES

1. Morcos B, Amarin R, Abu Sba A, Al-Ramahi R, Abu Alrub Z, Salhab M. Contemporary management of perianal conditions in febrile neutropenic patients. *Eur J Surg Oncol* 2013;39(4):404-7.
2. Baker B, Al-Salman M, Daoud F. Management of acute perianal sepsis in neutropenic patients with hematological malignancy. *Tech Coloproctol* 2014;18(4):327-33.
3. Vuille-dit-Bille RN, Berger C, Meuli M, Grotzer MA. Colostomy for perianal sepsis with ecthyma gangrenosum in immunocompromised children. *J Pediatr Hematol Oncol* 2016;38(1):53-7.
4. Bordes J, Le Floch R, Bourdais L, Gamelin A, Lebreton F, Perro G. Perineal burn care: French working group recommendations. *Burns* 2014;40(4):655-63.
5. Bordes J. Response to letter to the editor: perineal burn care: French working group recommendations [Burns 2014;40:655-63]. *Burns* 2015;41(6):1368-9.
6. Ichimiya M, Takita Y, Yamaguchi M, Muto M. Case of purpura fulminans due to septicemia after artificial abortion. *J Dermatol* 2007;34(11):786-9.
7. Bouneb R, Mellouli M, Regaieg H, Majdoub S, Chouchene I, Boussarsar M. Meningococemia complicated by myocarditis in a 16-year-old young man: a case report. *Pan Afr Med J* 2018;29:149.
8. Simsic JM, Dolan K, Howitz S, Peters S, Gajarski R. Prevention of pressure ulcers in a pediatric cardiac intensive care unit. *Pediatr Qual Saf* 2019;4(3):e162.
9. Price CE, Cox S, Rode H. The use of diverting colostomies in paediatric peri-anal burns: experience in 45 patients. *S Afr J Surg* 2013;51(3):102-5.
10. Quarmby CJ, Millar AJ, Rode H. The use of diverting colostomies in paediatric peri-anal burns. *Burns* 1999;25(7):645-50.