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Conservative Management by Escharification for Unruptured Omphalocele in a Resource-Limited Setting: A 7-Year Experience at the Albert Royer Children's Hospital in Dakar (83 Cases)

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Abstract | **Original Research Article**

Conservative management by escharification remains a relevant strategy for the treatment of unruptured omphaloceles in resource-limited settings. This retrospective study was conducted in the Department of Pediatric Surgery at the Albert Royer Children's Hospital in Dakar between December 2012 and December 2020. It included 83 cases of unruptured type I and type II omphaloceles, according to the Aitken classification, treated exclusively with topical application of 2% aqueous disodium eosin twice weekly until complete epithelialization. The mean age at admission was 2.3 days, with a male-to-female ratio of 0.8. Prenatal diagnosis was established in only 30.1% of cases, and type I omphalocele accounted for 65.1% of the cohort. Associated malformations included minor cardiac defects in 34.9% of patients and six syndromic cases, all of whom died before epithelialization. Complete epithelialization was achieved in 77 patients, with a mean time to epithelialization of 33.5 days in non-infected patients. Local infection occurred in 25.3% of cases and had a favorable outcome in all patients. Abdominal wall repair was performed in 76 children at a mean age of 18.1 months. Rectus abdominis diastasis was observed in 20.4% of type I cases and 90.1% of type II cases. Cosmetic outcomes, assessed by parents using a Likert scale, were considered satisfactory in 41.3% of cases. This experience demonstrates that escharification with aqueous eosin remains a valid treatment option in resource-limited settings, providing promising long-term outcomes.

Keywords: Omphalocele; Escharification; Aqueous eosin; Resource-limited setting; Aitken classification.

I. INTRODUCTION

Omphalocele is a congenital malformation characterized by failure of the umbilical ring to close, resulting in the herniation of abdominal viscera covered by a translucent, avascular amniotic membrane [1]. The choice of therapeutic approach depends on the size of the omphalocele, the presence of associated malformations, and the general condition of the fetus [2]. Surgical closure remains the preferred treatment in many regions where modern medical resources are readily available [3]. However, in developing countries with limited medical resources, escharification remains a relevant treatment strategy for omphalocele [4]. Escharification is a long-established technique that involves the application of escharotic agents to the amniotic membrane. These agents harden the membrane, creating a protective barrier around the herniated abdominal viscera until complete epithelialization occurs [5]. In this study, we report our experience with 83 cases of omphalocele managed in Dakar, with the aim of evaluating the effectiveness of the non-operative management of omphalocele.

II. PATIENTS AND METHODS

This retrospective descriptive study included 83 patients with omphalocele managed in the Department of Pediatric Surgery at the Albert Royer Children's Hospital in Dakar between December 2012 and December 2020, over a 7-year period. Patients diagnosed with unruptured type I or type II omphalocele according to the Aitken classification [6] and treated by escharification with 2% aqueous disodium eosin were included. Patients with ruptured or giant omphaloceles managed by other treatment methods were excluded. A total of 83 patients

met the inclusion criteria. The study variables included age at admission, sex, prenatal diagnosis, the anatomoclinical type of omphalocele according to the Aitken classification, time to epithelialization, complications, age at abdominal wall repair, and treatment outcomes. Screening for associated malformations was performed systematically by clinical examination in all neonates and was supplemented, when necessary, by ultrasonography and skeletal radiography. Treatment consisted of topical application of 2% aqueous disodium eosin twice weekly until complete epithelialization was achieved.

Data were collected from the patients' medical records and entered into Microsoft Excel 2022 for analysis.

III. RESULTS

We identified 83 patients with omphalocele who were treated exclusively by eosin escharification. The mean age at admission was 2.3 days (range, 0–13 days). The male-to-female ratio was 0.8. Prenatal diagnosis was established in only 25 patients, including 13 with type I and 12 with type II omphalocele, representing 30.1% of the study population (Table I).

Table I: Prenatal Diagnosis by Omphalocele Type

Prenatal Diagnosis	Type I	Type II	Total
No - Count	41	17	58
No - %	75.9	58.6	69.9
Yes - Count	13	12	25
Yes - %	24.1	41.4	30.1
Total - Count / %	54 / 100	29 / 100	83 / 100

In the majority of cases (65.1%), the omphalocele was classified as type I according to the Aitken classification. We identified six cases of syndromic omphalocele, minor cardiac malformations in 34.9% of patients, two cases of isolated skeletal malformations, and one case of bladder exstrophy. Unfortunately, all patients with syndromic omphalocele died before epithelialization, including two who died from sepsis. The mean time to epithelialization was 33.5 days (range, 19–63 days) in non-infected patients and 45.7 days in patients with local infection. Overall, complete epithelialization was achieved in 77 patients. Among patients with type I omphalocele, most achieved complete epithelialization within 4 to 8 weeks, whereas more than half of those with type II omphalocele required more than 8 weeks to achieve complete epithelialization (Tables II and III).

Table II: Duration of Escharification by Omphalocele Type

Duration (weeks)	Type I		Type II	
	n	%	n	%
< 2 weeks			3	10.3
2 - 4 weeks	12	22.2	3	10.3
4 - 8 weeks	41	75.9	16	55.2
> 8 weeks	1	1.9	7	24.1

Table III: Duration of Treatment by Presence of Infection

Infection	Mean Duration	Standard Deviation	p-value
No	33.42	11.44	0.0001
Yes	45.71	12.70	

Local infection occurred in 25.3% of patients and was associated with a favorable outcome. Seventy-six children underwent abdominal wall repair. The mean age at repair was 18.1 months (range, 6–42 months). Postoperative rectus abdominis diastasis was observed in 20.4% of patients with type I omphalocele and 90.1% of those with type II omphalocele. When parents were asked to evaluate the cosmetic outcome using a Likert scale, 12% were dissatisfied, 46.7% were neutral, and 41.3% were satisfied with the cosmetic result.

IV. DISCUSSION

Prenatal diagnosis of omphalocele is of paramount importance, as it allows delivery to be planned in a specialized center, facilitating immediate postnatal management [7]. Unfortunately, the low rate of prenatal diagnosis remains a concerning reality in Africa. In our study, only 30.1% of patients had a prenatal diagnosis. This low proportion is worrisome, as most cases were diagnosed only after birth, which may complicate management. Limited prenatal diagnosis remains a concerning reality in Africa, with rates of 12.5% in Gabon [8], while in recent studies from Madagascar and Congo, no prenatal diagnoses of omphalocele were reported [5,9]. This situation underscores the challenges faced by health systems in some African regions in achieving early detection of congenital malformations.

In developed countries, staged reduction using a silo has become the standard treatment for omphalocele, thanks to advances in anesthesia, neonatal intensive care, and prenatal diagnosis [3]. Both staged closure and primary closure of an omphalocele can lead to intra-abdominal hypertension [10,12]. Primary closure requires specific resources and equipment. Unfortunately, these resources are often unavailable in many resource-limited regions. The lack of adequate equipment to monitor abdominal compartment syndrome, the absence of neonatal parenteral nutrition, and the limited availability of pediatric intensive care units make the implementation of primary closure challenging. These constraints largely explain our therapeutic approach. The Aitken classification has both prognostic and therapeutic value. Type I omphaloceles have a better prognosis and are generally managed with primary closure [7]. Escharification avoids the need for major neonatal surgery [13]. In Senegal, mortality associated with neonatal digestive surgery is high, reaching 28%; therefore, we decided to include all types of omphalocele to postpone surgical repair [14]. This approach may help reduce mortality associated with neonatal surgery by allowing neonates to achieve a more stable clinical condition before surgery. In our study, all patients with syndromic omphalocele died. The mortality rate associated with omphalocele is around 25% across different series and is strongly associated with chromosomal abnormalities and associated malformations, which are reported in up to 50% of cases [15]. Escharification is a simple method requiring few resources and does not result in intra-abdominal hypertension; however, the main factors contributing to morbidity and mortality are infection and the risk of amniotic membrane rupture [16,17]. Several escharotic agents have been proposed; some were rapidly abandoned due to their toxicity following absorption through the sac membrane, leading to death in some cases [18]. The use of aqueous eosin as an escharotic agent was first described by Kouame *et al.,*in their study, the results obtained with aqueous eosin were comparable to those obtained with other agents in terms of hospital stay, morbidity, and mortality [19].

Infection was the most common complication in our study. This highlights the need for appropriate infection management during escharification treatment. Infection control and the prevention of infection spread are crucial to the success of this method and must be considered when planning and implementing treatment.

According to Nkole Aboughe *et al.,* in Gabon, six of the seven patients with omphalocele died postoperatively [8]. Similarly, in Côte d'Ivoire, Kouame *et al.,* reported that, over a 15-year period, patients with omphalocele died despite medical treatment, while 67% died postoperatively [4]. These findings highlight the importance and advantages of conservative management over surgical management in our context.

The mean duration of epithelialization reported in recent studies ranged from 60 to 100 days for so-called giant omphaloceles [5,8]. We found a shorter duration, although this period was prolonged in the presence of local infection. This underscores the significant impact that infections can have on healing.

According to several authors, ventral hernia repair is performed between 6 and 12 months of age. If needed, a prosthetic mesh may be used to facilitate fascial defect closure [20,21]. In our study, no child underwent prosthetic repair, and ventral hernia repair was performed between 6 and 42 months of age, without financial constraints representing a major barrier. The high rate of diastasis (90%) after ventral hernia repair for type II omphaloceles may be explained by the unavailability of prosthetic material. Overall, more than half of the parents reported being satisfied with the cosmetic result. This subjective evaluation reflects variability in parental aesthetic perceptions, often depending on multiple factors, including individual expectations and personal experiences.

V. CONCLUSION

In developed countries, staged reduction using a silo has become the standard treatment for omphalocele. However, our study demonstrates that escharification remains a valuable therapeutic approach, offering promising long-term outcomes in the management of this congenital malformation. In the absence of adequate pediatric intensive care, conservative treatment should be preferred, under these circumstances, primary closure should only be considered for ruptured omphalocele. Ultimately, this study reinforces the idea that the choice of treatment strategy for omphalocele should be tailored to the available resources, the severity of the malformation, and the general condition of the newborn. Aqueous eosin escharification remains a valid option. However, careful infection management and further research are essential to optimize clinical outcomes and to better assess its long-term efficacy and safety.

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