

Case Report

Successful Surgical Separation of Conjoined Twins: Lessons from the Past and Non-Technical Skills Management in a Sub-Saharan Low-Setting Country

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Article History

Received: 22.10.2024

Accepted: 26.11.2024

Published: 28.12.2024

Journal homepage:

<https://www.easpublisher.com>

Quick Response Code



Abstract: Anesthesia for surgical separation of conjoined-twin is not an unusual situation. The occurrence of birth of these babies is 1:50,000 to 250,000 live births. Their surgical separation remains a great challenge, especially in our low-settings context. The success of the intervention depends largely on the organization and planning of the surgical procedure. The medical simulation of the procedure and the distribution of roles between different actors interacting collegially is a fundamental issue for surgical success as we describe it through the experience drawn from these clinical cases.

Keywords: Anesthesia, conjoined-twin, simulation, Sub-Saharan Africa.

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INTRODUCTION

Anesthesia for the separation surgery of conjoined twins is a rare and occasional practice. However, advances in pediatric anesthesia noted in our Sub-saharan Africa area and the quality of pregnancy follow-ups increase the incidence of this surgical activity [1]. In Africa, also due to the low resources settings, this surgical separation remains a major problem with high morbidity and mortality [2] particularly in sub-Saharan Africa where surgical results are particularly burdened with often fatal complications [3]. Perioperative

management of this type of patient is complex and multidisciplinary. Therefore, preparation for the intervention on a multitude of aspects is a major challenge. Among which non-technical skills constitute the cornerstone of management to hope for surgical success. We report through this work the importance of non-technical skills in the surgical separation of thoraco-omphalopagus conjoined twins in a resource-limited context at the Albert Royer Children's Hospital.

DESCRIPTION OF CASES

All parent's consent was obtained.



Figure 1: First case of omphalopagus conjoined-twins after anesthesia induction and the survival one year after follow up

In December 2018, two 47-day-old conjoined thoraco-omphalopagus babies were separated in our department. They needed a preoperative assessment and a multidisciplinary discussion for management. The procedure took place in an operating room with a single supply of medical fluids (air, oxygen, N2O). Previously, no such procedure had been performed, apart from the senior surgeon, no one in the team had experience in this

type of surgery. A multidisciplinary assessment involving neonatologists, anesthesiologists, radiologists and surgeons had taken place once. The postoperative course was marked by the death of one of the twins (S2) on day 2 of the procedure. At the age of 3 years, S1 underwent an eventration closure without any notable particularity and currently she is alive and well and in school (fig1).

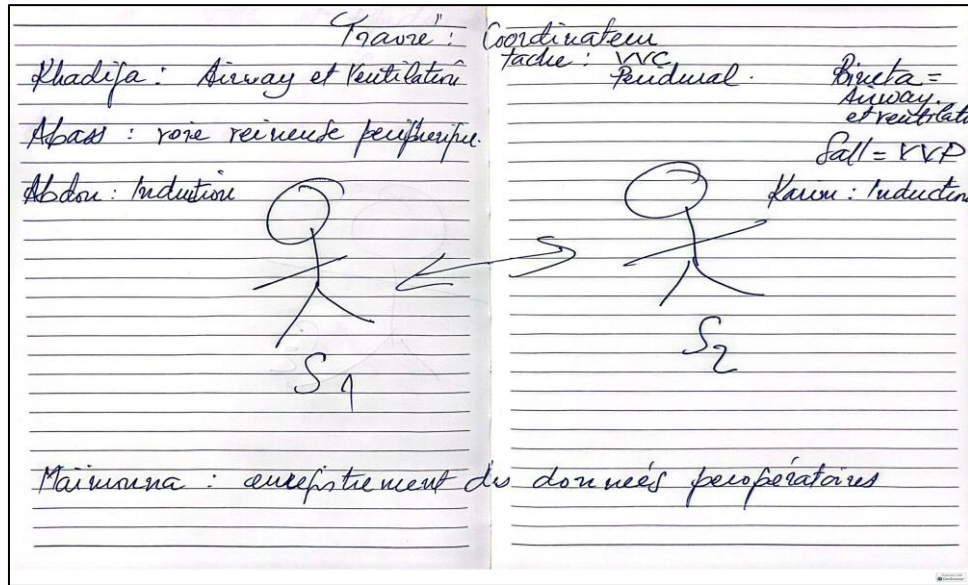


Figure 2: paperboard for the management of task separation in intraoperative time

In August 2023, less than 5 years later, we welcomed conjoined omphalopagus twins in new operating rooms designed for this purpose. They were 11 months old and had benefited from several assessments and close monitoring since birth. The multidisciplinary assessment of the same stakeholders had decided to delay the intervention for a favorable age favoring morphological and weight development. Three

multidisciplinary meetings were organized inspired by the practical experience of the first cases whose surgical separation was judged quite early. Thus, a simulation had been recommended before the intervention. The anesthetic approach consisted essentially of the assessment of the airways, and the distribution of tasks through a written document and to be followed during the procedure (fig 2)



Figure 3: In task separation everyone stays focused on his own role with the supervision of the coordinator

1. Babies identified in S1 and S2 with their name attached
2. Task 1: a team leader, more experienced anesthetist in charge of complicated tasks, namely central line and epidural catheter placement
3. Task 2: airways; Intubation and ventilation managed by a senior anesthetist for each twin
4. Task 3: Perfusion and peripheral venous route by a nurse anesthetist for each
5. Task 4: Preparation of anesthetic drugs and induction according to the protocol pre-established in simulation for each baby by a 3rd year resident

6. Task 5: Recording monitoring elements on paper file

By making this division of tasks, the anesthesia was carried out without interference or hesitation. The twins were successfully separated 2 hours after anesthetic induction. The operating time was 2 hours with a total time of 5 hours and extubation in the SSPI at 6 hours (fig 4.). No incident or complication was noted. Postoperative follow-up with a 13-month follow-up shows that the twins are alive with good height and weight growth and good psychomotor development, currently aged 2 years.



Figure 4: Twins postoperatively at the PACU and 5 days after surgery in hospital room

DISCUSSION

Surgical management of conjoined babies presents several challenges for surgical success. These cases reported in our experience clearly show the impact of non-technical skills on the final outcome.

Scheduling and preparation of the intervention

After our first case in 2019, a WhatsApp® team group for child birth defect was created gathering many physicians in Dakar, neonatologists, anesthesiologists, surgeons, pediatric cardiologist, radiologist.

The surgical scheduling began as soon as the hospital resumed the construction of new operating rooms. The design of rooms that could operate on 2 patients at the same time by doubling the arrival of wall fluids and a space large enough for 2 operating tables was carried out, correcting the shortcomings of the past. Indeed, taking into account the data on the birth rate... but especially the diagnostic means and the possibility of local management, 7 cases of birth of conjoined babies were recorded in Dakar between 2016 and 2023. This made it possible to realize the growing probability of surgical management, especially in our country where abortion out of medical reason is illegal.

It was a time for collegial discussion between different team involved in care, both technical health personnel and administrative personnel responsible for collecting funds and providing the equipment required by practitioners. This approach is essential in these particularly unusual circumstances. In several series of literature this path has been adopted [4, 5]. The essential point at this phase is the ideal time of the intervention usually at 8 to 11 months of life. By comparing our first cases operated on at 49 days of life to the last at 11 months of life, we note that the intervention should probably be postponed to a period when the risk seems lower, especially in a country with low resources. The team then put forward the common idea of postponing the intervention based on the technical difficulties of the past.

Simulation: situational awareness, task allocation

The training acquired in the field of medical simulation justified its integration into the care of conjoined babies. Indeed, the impact of the human factor in high-risk operating procedures is a major consideration. The approach through non-technical skills in addition to technical skills contributes to the safety and effectiveness of the procedures performed on the patient [4]. This evidence of the essential role of the human

factor required training in medical simulation for team members through the VAST (Vital Anesthesia Simulation Training) program in Dakar in January 2023. The clear situational awareness of anesthesia for conjoined twins, the need to work together in large numbers of actors in the same place and on the same patient should not be improvised. By using the VAST model adapted to our countries with limited resources, we particularly insisted on the distribution of roles and tasks of the different actors to avoid harmful interactions. This approach allowed easy coordination, time saving, stress management and fluid communication in a situation as rare and delicate as the surgical separation of these children. These moments, during anesthesia were especially the induction taking into account the possibility of cross-circulation, airway management, and especially orotracheal intubation. These phases with high risk of complications went well in good coordination.

Discussion of steps and anticipation of complications

Like an Indian team working in a situation with limited resources, we adopted an attitude close to their support plan. A whole team had mobilized to provide the necessary resources. We had previously expressed the needs and the means available to succeed in the separation. The involvement of everyone, from the medical staff to the administrative staff in charge of financing, through joint meetings was a strong point of success.

Looking at the medical literature on surgical separation of omphalopagus twins, we anticipated possible complications including hemorrhage, the possibility of cross-circulation. This risk is discussed and anticipated by the provision of blood products checked at the establishment of a safety checklist for the operating room according to World Health Organization surgical checklist.

CONCLUSION

From these rare and complex cases of anesthesia for separation of conjoined babies, our experience clearly demonstrates the place of medical simulation and non-technical skills for surgical success, despite a context of low resources. We recommend that teams, especially in Sub-Saharan Africa adopting this kind of approach which, beyond the surgical and anesthetic technical aspects, greatly contributes for optimal outcome.

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Cite this article: Traore MM, Ndoye NA, Diop MN, BA EB, Ndiaye MD, Diouf KBE, Sarr BL, Welle IB, Gueye D, Sagna A, Ngom G, Diouf E (2024). Successful Surgical Separation of Conjoined Twins: Lessons from the Past and Non-Technical Skills Management in a Sub-Saharan Low-Setting Country. *EAS J Anesthesiol Crit Care*, 6(6), 147-150.
