Clinical Reports

Anaesthetic considerations for separation of omphalo-ischiopagus tripus twins

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Anaesthesia for the separation of conjoined twins requires a multi-disciplinary team approach. We describe the anaesthetic management of a single-stage separation of 2½-year-old omphalo-ischiopagus tripus conjoined twins. The successful 17½-hour operation was conducted by five anaesthetists and 38 surgeons and nurses. Two major problems were encountered: massive blood loss in both twins (requiring transfusions of more than five and seven times their blood volumes) and a transient decrease in core temperatures after separation.

Since the first reported successful separation of conjoined twins by König in 1689, this operation has continued to challenge anaesthetic and surgical teams. Although the risks of surgical separation have been reduced by modern anaesthesia and surgery, life-threatening complications can still occur during separation of the more complex conjoined twins. The successful anaesthetic management of these cases includes (1) a detailed pre-operative preparation, (2) recognition of potential

intraoperative problems, and (3) intensive intra-operative monitoring.

The incidence of conjoined twins has been estimated to be as high as 1 in 50–60,000 and as low as 1:200,000 annual births.^{1–10} This variation in incidence may be explained in part by the difficulties of documenting very uncommon cases in remote parts of the world. Between 40 and 68 per cent of conjoined twins are stillborn, and approximately 35 per cent of the live births do not survive the first 24 hours of life.⁸ The high perinatal mortality may be attributed to an increased incidence of prematurity and low birth weight in these infants. It has been estimated that as few as six pairs of conjoined twins born each year are likely to survive definitive separation.^{9,10–12}

The aetiology of conjoined twins is unclear.^{1–3,6–22} It has been suggested that both environmental and maternal factors may be important. There is an increased incidence of conjoined twins in south-east Asia and certain parts of Africa, with evidence of local clustering of cases within these areas.^{6,8,11,20} Although there is no clear relationship between maternal factors and the incidence of conjoined twins, there does appear to be an increased incidence of previous singlet stillbirths in the mothers of conjoined twins.⁹ Intra-uterine hypoxia and malnutrition have also been suggested as aetiological factors.⁶ It has been suggested that conjoined twins may result from the fusion of two separate fertilized ova, although there is strong evidence to support a monozygotic origin.^{1,6–10,12–15,17,21,22} This latter hypothesis is supported by the observation that the sex of con-

Key words

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joined twins is identical in almost every reported case.⁹

Most conjoined twins are united anteriorly (73 per cent) – at either the chest wall (thoracopagus), xiphoid or upper abdominal levels (xiphopagus or omphalopagus); the remainder may be joined back to back (pyopagus 19 per cent), end to end, side to side at the pelvis (ischiopagus six per cent), or head to head (craniopagus two per cent).^{1,4,23} Ischiopagus twins are further divided according to the number of lower extremities present – ischiopagus bipus (two extremities), tripus (three extremities), and tetrapus (four extremities).

Omphalo-ischiopagus twins represent a subgroup of conjoined twins who present more complex problems in separation. Such patients may share both upper and lower gastrointestinal organs (including the liver and biliary systems), genitourinary tracts, arterial and venous circulation below the diaphragm, major skeletal structures, and the spinal cord. There have been eight reported cases of separation of ischiopagus conjoined twins (four tetrapus and four tripus).^{1,5,6,24–27} The overall perioperative mortality was 50 per cent. In those cases of ischiopagus tripus twins which were successfully separated, surgery was achieved by multiple procedures staged over a period of time. However, in those cases which were unsuccessful, the causes of death were multifactorial.^{5,6,26,27} The high perioperative mortality in these children underscores the need for a heightened awareness of the potential anaesthetic problems in this type of surgery and a greater exchange of information to improve the management and reduce mortality. This report describes the first successful single-staged separation of omphalo-ischiopagus tripus conjoined twins.

Case history

On February 18, 1982, conjoined twins (A and B) with a combined weight of 5.0 kg, were delivered by Caesarian section, after a full term pregnancy. They were joined side to side from below the rib cage to the pelvis. They shared one umbilicus, one set of genitalia, and a middle (third) leg. Their heads and chests were separate forming a "Y" with the conjoined abdomen and pelvis (see Figure 1). At nine months of age they underwent a laparotomy for drainage of a retroperitoneal dermoid cyst in twin B. Twin A required repeated anal dilatations for

FIGURE 1 Illustration of omphalo-ischiopagus tripus conjoined twins. Twin A is shown on the right and twin B on the left. The dashed line indicates the line of skin incision which was optimal for skin closure after separation.

anal stenosis. Apart from these problems, they were healthy. At the age of 2½ years, they were transferred from the Children's Hospital in Rangoon to The Hospital for Sick Children in Toronto, for further investigation and separation.

The preoperative evaluation of the twins (summarized in Tables I and II) revealed the following anatomical features:

Cardiovascular system

Twin A had uncomplicated dextrocardia, and twin B had a normal heart. Blood pressure, heart rate, and the remainder of the cardiovascular examinations were normal in both children. Electrical activity from one twin interfered with the electrocardiogram of the second twin. Cross-circulation was assessed indirectly using a sulphur colloid liver scan, glucoheptonate (renal) scan, and computerized axial tomography (CAT). The cross-circulation through the conjoined liver was estimated to be ten per cent of the total hepatic blood flow. Cross-circulation was present in the conjoined bowel, the third leg, and the skin. Although a blood volume study was not performed, the total cross-circulation was estimated to be no more than 15 per cent of the cardiac output. Both twins supplied blood to the larger kidney in each twin, although the

TABLE I Preoperative laboratory data

<i>Preoperative examination</i>	<i>Twin A</i>	<i>Twin B</i>
Electrocardiogram (ECG)	Sinus rhythm, RAD, RVH. Electrical interference from twin B's ECG	Normal
Chest x-ray	Normal	Normal
Complete blood count		
Haemoglobin (10.1–14.0 g/dl)	12.0	10.4
Haematocrit (33–40 vol%)	38.3	35.6
Platelets ($150\text{--}400 \times 10^3/\text{mm}^3$)	654	641
Liver function tests (bilirubin, SGOT, alkaline phosphatase, total protein, and albumin)	Normal	Normal
Coagulation test		
PT (10–12 secs)	11.0	11.0
APTT (25–40 secs)	36.6	36.6
Plasma urea and electrolytes	Normal	Normal
Hepatitis B tests (anti-core and anti-surface antibodies, and hepatitis B surface antigens)	Negative	Negative

major blood supply for each kidney arose from the respective twin. Both twins had a hypochromic, microcytic anaemia.

Respiratory

The respiratory systems of both twins were separate and unremarkable except for the chest wall in twin A which was deformed in the anterior axillary line (Figure 1).

Gastrointestinal tract

The twins had normal upper gastrointestinal tracts, as shown with an upper gastrointestinal series. The small intestines were joined at the terminal ileum just distal to a Meckel's diverticulum in twin B. This led to a common cecum and colon. The descending colon was divided by a septum from the level of the splenic flexure to the recto-sigmoid junction, at which point the colon divided into a rectum and anus for each twin. The hepatic and biliary scans revealed a conjoined liver, and a separate gall-bladder and biliary drainage for each twin (Figures 2 and 3). A spleen was demonstrated in twin A by CAT and liver scans. Because a spleen was not visualized in twin B, polyvax was given to prevent a pneumococcal infection. Adrenal tissue could not be identified in either of the twins.

Urogenital system

A renal scan, cystogram and urethrogram revealed

one large functioning kidney in each twin which emptied into a single, septate bladder. A smaller kidney was also present in each twin. There was a septate urethra joining at the level of the prostate and a single penis. Twin A had one undescended testicle and twin B one descended testicle.

Skeletal system

The vertebral columns and sacra were entirely separate. The twins were joined at the level of the iliac crests. The iliac crests were fused in the midline posteriorly where they articulated loosely with the third leg. The iliac wings and pubic rami were intact and formed a pseudosymphysis pubis anteriorly. Each twin had a single normal acetabulum and leg. The radiological examinations and scans are summarised in Table II.

Preoperative preparations

The preoperative preparation for surgery included consultations with anaesthesia, surgery, intensive care, nursing, medical engineering, respiratory technology, blood bank, and the biochemistry laboratory to arrange staffing, and to provide anaesthetic and surgical supplies, and continuous laboratory support for the duration of the surgery. The major surgical considerations included the sequence of organ separation, preservation of urinary continence, pelvic reconstruction, and the closure of the abdominal wounds in both twins. At

TABLE II Preoperative investigations

System	Test	Result
Cardio-respiratory	Chest x-rays ECG	Normal See Table I
Vascular	Liver scan/CAT scan/ Renal scan	Cross-circulation at liver, kidney, large bowel; blood supply to third leg mostly from twin B. The estimated cross-circulation was 10–15% of the cardiac output.
Gastrointestinal	Upper gastrointestinal series and follow through	Separate small intestines, and rectums. Common terminal ileum, cecum, and colon.
Hepato-biliary	Sulphur colloid liver scan Biliary scan	Single, shared liver. Separate, functioning biliary systems.
Urogenital	Renal scan (Glucoheptonate)	Each twin had one large, lateral kidney and one small medial kidney.
	Cystogram Urethrogram CAT scan	Septate bladder, septate urethra with a single prostate and penis
Skeletal	X-ray CAT scans	Separate vertebral columns. Fusion of posterior iliac wings with loose articulation of third, shared leg. Pelvis fused anteriorly at pubic symphysis.

FIGURE 2 Illustration of the gastrointestinal tracts prior to separation. The shared abdominal organs and the proposed surgical divisions are shown. See text for an explanation of the letters A to E.

FIGURE 3 Illustration of the gastrointestinal tracts indicating the areas of bowel separation and re-anastomoses.

FIGURE 4 Schematic representation of the anaesthetic and monitoring equipment. For clarity, only twin A is shown.

the time of surgery, the twins were 29 months old and had a combined weight of 18 kg. Twin A, the larger of the twins, had an estimated weight of approximately 10 kg.

Anaesthetic method

Two anaesthetists were assigned to each of the twins and a fifth anaesthetist co-ordinated all ancillary bloodwork and blood tests. The twins were not premedicated. A #22 gauge cannula was inserted in the dorsum of the hand of each twin before surgery. On arrival in the operating room, each of the twins was monitored with an electrocardiogram, blood pressure cuff, doppler probe (on the radial artery), and a precordial stethoscope. Intravenous hydrocortisone hemisuccinate (25 mg) was administered to each of the twins prior to induction of anaesthesia. After pre-oxygenating the twins for three minutes, general anaesthesia was induced simultaneously with thiopentone $3 \text{ mg} \cdot \text{kg}^{-1}$, atropine $0.02 \text{ mg} \cdot \text{kg}^{-1}$, and succinylcholine $1.5 \text{ mg} \cdot \text{kg}^{-1}$. Nasotracheal intubation was performed in both twins without difficulty. They were ventilated with 60 per cent nitrous oxide in oxygen using an Air Shield's Ventimeter ventilator and a T-piece circuit for each twin. A Fisher-Paykel servo heated-humidifier was used to humidify the fresh gases. The monitors used included an oesophageal stethoscope, an oesophageal temperature probe, a pulse oximeter (to measure the oxygen saturation and heart rate), and an end-tidal CO_2 monitor for each of the twins. A radial artery was

cannulated in each twin, and the arterial blood pressure was monitored continuously. The monitors and intravenous lines are shown in Figure 4.

Anaesthesia for each twin was maintained with isoflurane (0.5–1.0 per cent dial setting) in 60 per cent nitrous oxide in oxygen, supplemented with a continuous morphine infusion ($20 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{hr}^{-1}$) in each of the twins. Muscle relaxation was provided by incremental doses of pancuronium as necessary.

The intraoperative fluid management consisted of replacing (1) the preoperative fluid deficit ($4 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{hr}^{-1}$),* (2) the intraoperative maintenance ($4 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{hr}^{-1}$),* (3) the estimated intraoperative third space losses ($10\text{--}15 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{hr}^{-1}$), and (4) the intraoperative blood losses (Table III, Figure 5). The blood loss was estimated by the combined weight of the bloody sponges and the volume of blood in the suction bottles. Until the twins were separated, each twin received half of the total blood loss. A platelet count, prothrombin time (PT), and activated partial thromboplastin time (APTT) were measured when the blood loss exceeded $1\frac{1}{2}$ blood volumes, and then hourly thereafter. The arterial blood gases, electrolytes, haematocrit, and serum concentration of ionized calcium were measured hourly (Figure 5).

The surgery was divided into three phases: in the first phase (lasting one hour), a silastic cannula was inserted into the internal jugular vein in each child in order to monitor the central venous pressure (CVP) during the surgery and to administer parenteral nutrition in the postoperative period. In the second stage (lasting three hours), a cystoscopy was performed to clarify the anatomy of the conjoined urethral sphincters. In the third stage (lasting 12 hours), the twins were separated.

The surgery for separation of the twins was completed by four surgical teams working in series. The plastic surgeons created anterior abdominal flaps. The general surgeons then divided the ante-

TABLE III Intraoperative fluids administered during surgery

	Twin A	Twin B
Crystalloid (ml)	3250	2500
Whole blood (ml)	5250	3300
Platelets (ml)	70 (6 units)	55 (4 units)

*For infants weighing 10 kg or less.

FIGURE 5 Intraoperative platelet count, haematocrit, and crystalloid and blood replacement are shown on the four graphs. At the time marked X, 2 units of platelets were given to each twin, and at the time marked Y, 4 units of platelets were given to twin A and 2 units to twin B.

rior abdominal wall to the level of the diaphragm. A chest tube was inserted into the pleural cavity in twin B after the pleura was inadvertently punctured. A six-inch-wide conjoined bridge of liver was then divided, and the small and large bowels were reconstructed (Figures 2 and 3). In twin B, the small bowel was divided proximal to Meckel's diverticulum (A) and anastomosed to the sigmoid colon (B). Meckel's diverticulum and the appendix were removed. In twin A, the small bowel continued uninterrupted. A colostomy (C) was created in twin A at the splenic flexure, and a small portion of the descending colon was used to form a vagina (E).

FIGURE 6 Intraoperative core temperature during surgery. A sudden decrease in temperature in both twins occurred after separation, despite measures to conserve heat loss.

The sigmoid colon was separated along its septum and anastomosed to bowel (B and D, Figure 3). A tight anal stenosis in twin A was incised longitudinally and closed transversely in the fashion of Heineke-Mikulicz pyloroplasty. The orthopaedic team divided the pubic rami, and the urology team divided the bladder, bladder neck and urethrae. The orthopaedic team then performed osteotomies to separate the fused iliac wings, and divided the muscle wall and skin of the back. Primary closure of the abdominal wall in twin A was completed with silastic and marlex sheets, whereas primary closure in twin B was completed with a rotational flap of skin and muscle from the deboned leg. This reconstruction phase took 5½ hours.

Intra-operative problems

The temperature of both of the twins decreased minimally during surgery (Figure 6). The temperature was maintained by the close control of room temperature (24°C), and with the use of heating blankets, blood warmers, and heated humidifiers. Immediately after separating the twins, the core temperature in twin A decreased to 34.9°C and that in twin B decreased to 35.8°C. This occurred after a large surface area of tissue and bowel had been exposed to ambient temperature for a prolonged period. Despite increasing both the humidifier and room temperatures, the core temperature in twin A did not return to normal until the abdominal cavity was closed.

The blood volumes and the extent of the cross-circulation between the twins were not known. It was therefore impossible to attribute a precise percentage of the total blood loss to each of the

twins. Crystalloid and blood were replaced according to (1) the preoperative fluid deficits, (2) the circulatory variables (arterial blood pressure, CVP, heart rate, peripheral perfusion, and haematocrit), and (3) the measured blood loss (50 per cent of the blood loss was replaced in each of the twins). Balanced salt solutions, packed cells, and plasma (fresh frozen and stored) were used. Urine output could not be measured because of the extensive urological surgery. The fluid regimen described was effective in maintaining circulatory homeostasis throughout surgery despite the massive blood loss. Large volumes of crystalloid solutions and blood products were required during surgery (Table III, Figure 5). Twin A lost approximately 3400 ml of blood (4.5 times the estimated blood volume (EBV)) and twin B lost 3200 ml of blood (5.3 times the EBV). This was replaced with seven times the EBV as whole blood in twin A and 5.5 times the EBV as whole blood in twin B. Micro-pore blood filters were used after administration of the first unit of blood to each twin.

The arterial PCO_2 , and pH remained stable throughout the surgery, except for a brief period during which the PaO_2 decreased suddenly from 146 mmHg to 78 mmHg. This was caused by a pneumothorax in twin B during dissection near the diaphragm. The oxygen saturation did not fall below 94 per cent during this period. The pleural cavity was closed and a chest tube was inserted for the duration of surgery.

Sudden cardiovascular collapse after separation of omphalopus twins has been attributed to relative adrenal insufficiency in one of the twins. It has been suggested that corticosteroids should be given prophylactically to preclude this problem.^{12,13} Therefore, intravenous hydrocortisone hemisuccinate was given to both twins at induction of anaesthesia (25 mg each) and at the time of separation (5 mg each). There were no hypotensive episodes during surgery.

As a result of the massive transfusion, the platelet concentration decreased to 65,000 per cu mm in twin A and 63,000 per cu mm in twin B during surgery. Platelet concentrates were administered to both twins (Table III, Figure 5). Adequate levels of the clotting factors were maintained by using fresh frozen plasma. During surgery, the serum concentrations of ionized calcium were in the low-normal range (0.82 mmol·L⁻¹ in twin A and 0.88 mmol·L⁻¹

TABLE IV Postoperative blood results*

Test	Twin A	Twin B
Complete blood count		
Haemoglobin (10.1–14.0 g/dl)	9.0	10.1
Haematocrit (33–42 vol%)	27.2	30.0
Platelets (150–400 × 10 ³ /mm ³)	201	187
Coagulation test		
PT (10–12 secs)	11.8	11.8
APPT (25–40 secs)	35.4	30.7
Arterial blood gas/acid-base status		
FiO ₂	0.35	0.30
pH	7.55	7.42
pCO ₂ (mmHg)	37	35
pO ₂ (mmHg)	150	137
HCO ₃ (mmol·L ⁻¹)	33	23
Base excess (mmol·L ⁻¹)	+11	0
Serum sodium (135–143 mmol·L ⁻¹)	138	137
Serum potassium (3.5–5.2 mmol·L ⁻¹)	3.5	3.8
Serum chloride (99–111 mmol·L ⁻¹)	99	101
Serum glucose (2.2–5.0 mmol·L ⁻¹)	15.3	10
Serum ionized calcium (1.1–1.5 mmol·L ⁻¹)	1.79	2.08

*One hour postoperative.

in twin B). A brief decrease in systolic blood pressure (to 85 mmHg) with an increasing CVP in twin B was unresponsive to a fluid challenge. However, intravenous calcium gluconate (200 mg) restored the blood pressure and reduced the CVP to normal. At that time, the serum concentration of ionized calcium was 0.89 mmol·L⁻¹. Twin A also received intravenous calcium gluconate (200 mg) during the period of massive blood loss.

Postoperative care

After 17½ hours of surgery the twins were returned to the intensive care unit. On arrival in the intensive care unit, both twins moved their limbs and twin A opened her eyes. The cardiovascular and respiratory systems were stable postoperatively. The immediate postoperative blood tests are shown in Table IV. During the next 12 hours however, twin A lost a large volume of blood from her abdominal wound and was returned to the operating room the next day for ligation of a branch of the hypogastric artery. Twin B had an uneventful postoperative course and was extubated on the third postoperative day. Twin A was extubated one day later.

Discussion

Complex surgery for the separation of conjoined twins poses major problems for the anaesthesia

team.^{4,7,18,25,29-32} Body temperature, fluid and blood volumes, and blood coagulation must be carefully monitored. Conjoined twins of the ischiopagus variety are at an increased risk from these problems because of the extensive surgical dissection. It is essential that in the preoperative preparation of these patients adequate consideration be given to all of these potential intraoperative problems.

The anaesthetic technique used in this case was designed for general anaesthesia for prolonged surgery.³³ The anaesthetic agents with the pharmacokinetic and pharmacodynamic properties most suitable for this type of surgery should be selected. Because the cross-circulation in these twins was estimated to be no greater than 15 per cent of their cardiac output, we considered the circulation in each twin to be independent of the other. Therefore, the anaesthetic technique for each twin was individually optimized. Induction of anaesthesia, however, was performed simultaneously to provide optimal intubating conditions for both twins. The intravenous agents were administered on a weight basis, estimated from their combined weights and relative sizes. A morphine infusion was administered to provide continuous analgesia throughout the surgery and during the postoperative period.³⁴ Isoflurane was used because it has both low blood and fat solubilities, and because only a small fraction is metabolized.³⁵ Isoflurane can therefore provide general anaesthesia for prolonged periods and still allow rapid recovery at the completion of surgery. The choice of anaesthetic techniques (i.e., morphine infusion) and anaesthetic agents (i.e., isoflurane) provided an adequate depth of anaesthesia throughout the surgery and a rapid recovery at the completion of surgery.

Although all methods of temperature control were used (see anaesthetic method), there were periods during the surgery when the core temperature could not be maintained. In particular, during the long postseparation reconstruction phase of twin A, it was impossible to prevent a decrease in core temperature. We attributed this to the exposure of bowel and liver with consequent insensible fluid losses.

Large volumes of crystalloid fluids and massive blood transfusions are often required in this type of surgery. In anticipation of this problem, a constant reserve of packed cells and fresh frozen plasma

must be available throughout the surgery. The volume of crystalloid fluid required greatly exceeded the anticipated fluid requirements. We believe that this discrepancy may be attributed to excessive third space losses during surgery. Despite the differences in blood loss and the volumes of crystalloid fluids and blood replaced, the haematocrits of both twins were very similar prior to separation (Figure 5). A dilution thrombocytopenia ($<50 \times 10^3/\text{mm}^3$), a reduction in the concentration of coagulation factors, and hypocalcemia may complicate a massive transfusion. Platelet concentrates and fresh frozen plasma should be available from the blood bank for this type of surgery. The serum concentration of ionized calcium should be determined at regular intervals during massive blood transfusions. In this case, intravenous calcium was administered to restore a decrease in systolic blood pressure which failed to respond to a fluid challenge. The serum concentration of ionized calcium during this period was in the low normal range ($0.89 \text{ mmol}\cdot\text{L}^{-1}$). Hypotension and a low cardiac output state are usually caused by hypovolemia, and less frequently, by hypocalcemia. Intravenous calcium may be indicated in the latter case if clinical or electrocardiographic evidence of myocardial depression is present. Nevertheless, fluid resuscitation remains the primary therapeutic management for this problem.³⁶

Pulse oximeters were of limited use during this case. Although the oximeter is a very sensitive indicator of oxygen saturation on the descending portion of the oxy-haemoglobin dissociation curve, it has limited usefulness on the upper (flat) portion of the curve. When a pneumothorax developed in twin B, it was first detected by an arterial blood gas determination and not by the pulse oximeter. Although the arterial PO_2 decreased from 146 mmHg to 78 mmHg, the oxygen saturation remained unchanged; between 94 and 99 per cent. Thus, the pulse oximeter cannot be relied upon to aid in detecting such a problem if the PO_2 lies on or very close to the upper (flat) portion of the oxyhaemoglobin dissociation curve. Both pulse oximeters continued to malfunction intermittently throughout the surgery. One of the oximeters failed after 15 hours of use. However, pulse oximeters have been used continuously for periods far in excess of 15 hours without any reported malfunction. We attribute the failure of the pulse oximeter

in this case to excessive overheating from adjacent monitoring equipment.

Prophylactic corticosteroids are recommended at induction of anaesthesia and prior to surgical separation in conjoined twins.^{12,13,24-27} This is based on a recommendation by Aird who suggested that cardiovascular collapse after separation of omphalopagus conjoined twins may be attributed to adrenal insufficiency in one of the twins.¹² We believe that cardiovascular collapse after separation however, is more likely to be the result of hypovolemia than adrenal insufficiency. Although prophylactic corticosteroids should be given to prevent the manifestations of adrenal insufficiency, adequate fluid replacement remains the primary therapeutic management for preventing cardiovascular collapse in these cases.

The successful outcome of the surgery for separation of the conjoined twins may be attributed to the close co-ordination amongst the anaesthetic, surgical, and nursing teams. The full co-operation of other hospital departments such as the blood transfusion service and biochemistry laboratories is essential. The successful outcome of this case may be attributed to an integrated multi-disciplinary approach.

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Résumé

L'anesthésie pour la séparation de jumeaux siamois requiert une approche multidisciplinaire. On décrit la conduite anesthésique pour des omphalo-ischiopagus tripus âgés de 2½ ans. L'opération a duré 17½ heures et a été menée par cinq anesthésistes et 38 chirurgiens et infirmières. L'opération était couronnée de succès. Cependant deux problèmes majeurs ont été rencontrés: L'hémorragie massive requérant des transfusions supérieures à 5 et 7 fois leur volume sanguin et une diminution transitoire de la température centrale corporelle après la séparation.