Postoperative Outcome in Children aged between 6 and 10 years in Major Abdominal Surgery, Neurosurgery and Orthopedic Surgery

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Research Article

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Abstract

Background

Anticipating postoperative evolution in surgical patients is an important issue in our daily practice.

We demonstrated in a previous study that there were multiple predictors of postoperative outcome, including American Society of Anesthesiologists status (ASA), transfusion, emergency, surgery and age. A detailed description of postoperative outcome was undertaken in children aged between 6 and 10 years old included in the initial study.

Objective

To describe postoperative outcomes in children aged between 6 and 10 years old included in the initial cohort in abdominal surgery, neurosurgery and orthopedics.

Methods

The secondary analysis of postoperative outcomes in children aged between 6 and 10 years old was retrospectively included in the initial study of 594 patients. The study was approved by the Ethics Committee.

Results

There were 88 patients with a mean age of 98.7±13.8 months.

The most common surgical interventions were scoliosis in 23 patients (26.1%), limb tumor resection in 8 patients (9.1%), femoral osteotomy in 6 patients (6.8%), intracerebral tumor resection in 6 patients (6.8%), intestinal resection in 5 patients (5.6%), Chiari's malformation in 4 patients (4.5%), pelvic osteotomy in 4 patients (4.5%) and renal transplantation in 4 patients (4.5%).

Most patients (45%) were American Society of Anesthesiologists grade 3 (ASA 3), and 13 (14.8%) were ASA grade 4.

Twenty-two (25%) patients had intraoperative and/or postoperative complications (organ dysfunction or sepsis). Two patients (2.3%) had intraoperative hemorrhage, 1 patient (1.1%) had intraoperative difficult intubation, and 1 patient experienced intraoperative anaphylaxis. Nine patients (10.2%) had postoperative neurologic failure, and 2 (2.3%) had postoperative cardio-circulatory failure. Three patients (3.4%) had postoperative septicemia, 2 patients (2.3%) had postoperative pulmonary and urinary sepsis, and 1 patient (1.1%) had postoperative abdominal sepsis. 3 patients (3.4%) had re-operations. 42(47.7%) patients had intra-operative transfusion.

There was 1 in-hospital death (1.1%). The median total length of hospital stay was 9 days [5-16].

Conclusion

Twenty-five percent of the patients had intraoperative and/or postoperative complications, and most of them were ASA grade ³3. Integrating goal-directed therapies to optimize intraoperative management in these patients is necessary to improve postoperative outcomes in surgical pediatric patients.

Introduction

Postoperative outcomes in surgical patients are an important issue in our daily practice.

Predictors of postoperative outcome are multifactorial, among which American Society of Anesthesiologists status (ASA), transfusion, emergency, surgery and age were identified in previous studies (1,2,3,4). Predictors of postoperative outcome in this study were not exhaustive, which means that other nonidentified factors may contribute to how patients evolve after surgery.

For a better postoperative outcome, anticipating patient management optimization begins preoperatively and continues intraoperatively and postoperatively. Intraoperative patient optimization includes fluid and hemodynamic goal-directed therapy with tools validated in children, blood patient transfusion protocols guided with point-of-care tests in hemorrhagic surgery and enhanced recovery after surgery protocols (5,6,7,8,9,10,11,12,13). These goal-directed therapies have been shown in adults to improve postoperative outcomes. In children, goal-directed therapies are not well developed and are not in routine generalized practice.

The study presented here had the objective of describing postoperative outcomes in children aged between 6 and 10 years who were included in the initial retrospective study (1). The aim was to emphasize how these patients evolved after major surgery and to propose

improvement implementation protocols.

Methods And Materials

A secondary analysis of children between 6 and 10 years old was included in the initial study (1).

The study was declared to the CNIL, National Commission for Computer Science and Liberties on 21 February 2017 under the registration number 2028257 v0. The Ethics Committee of Necker approved the study on 21 March 2017 under registration number 2017-CK-5-R1. Patients were included retrospectively from 1 January 2014 to 17 May 2017.

The inclusion criteria were children aged between 6 and 10 years old.

The exclusion criteria were children aged less than 6 years old and older than 10 years.

Statistics were analyzed with XLSTAT 2020.4.1 software.

Continuous variables were described as the means ± standard deviation or medians with interquartile ranges. Categorial variables were described in proportions.

Results

Table 1 illustrates the general characteristics.

There were 88 patients with a mean age of 98.7±13.8 months.

There were 17 patients (19.3%) who underwent abdominal surgery, 26 (29.5%) who underwent neurosurgery and 45 (51.1%) who underwent orthopedic surgery. 11 patients (12.5%) had an emergency intervention.

Table 2 illustrates types of surgery.

The most common surgical interventions were scoliosis in 23 patients (26.1%), limb tumor resection in 8 patients (9.1%), femoral osteotomy in 6 patients (6.8%), intracerebral tumor resection in 6 patients (6.8%), intestinal resection in 5 patients (5.6%), Chiari's malformation in 4 patients (4.5%), pelvic osteotomy in 4 patients (4.5%) and renal transplantation in 4 patients (4.5%).

Most patients (45%) were American Society of Anesthesiologists grade 3 (ASA 3), and 13 (14.8%) patients were ASA grade 4.

Twenty-two (25%) patients had intraoperative and/or postoperative complications (organ dysfunction or sepsis).

The most common intraoperative complication was hemorrhagic shock in 2 patients (2.3%), followed by difficult intubation and anaphylaxis in 1 patient (1.1%). The most common postoperative organ failure was neurologic in 9 patients (10.2%), followed by cardio-circulatory in 2 patients (2.3%). The most common postoperative infection was septicemia in 3 patients (3.4%), followed by pulmonary and urinary sepsis in 2 patients (2.3%) and abdominal sepsis in 1 patient (1.1%). 3 patients (3.4%) had re-operations. 42(47.7%) patients had intra-operative transfusion. There was 1 in hospital death (1.1%) (Table 3).

The median total length of hospital stay was 9 days [5-16].

Table 4 illustrates outcomes per surgery.

Table 5 illustrates co-morbidities. The most common comorbidities were intracerebral tumor in 7 patients (7.9%), Ewing's sarcoma in 5 patients (5.7%), psychomotor deficiency in 5 patients (5.7%), arthritis in 4 patients (4.5%), cerebral anoxic lesions in 4 patients (4.5%), chronic renal failure in 4 patients (4.5%), hepatic failure in 4 patients (4.5%) and polymalformation syndrome in 4 patients (4.5%).

Discussion And Conclusion

The rate of patients with intraoperative and/or postoperative complications in this cohort of 88 children between 6 and 10 years of age who underwent major abdominal surgery, neurosurgery and orthopedics was 25%. These patients were in majority ASA grade 3 or more. As revealed in the initial studies (1,2,3,4), postoperative outcome depends on multiple factors, precisely ASA status, transfusion, age, emergency and surgery. Integrating goal-directed therapies for intraoperative management in these patients is necessary to improve postoperative outcomes in pediatric surgical patients. Goal-directed therapies include intraoperative fluid and hemodynamic goal-directed therapy with

validated tools in children, intraoperative transfusion goal-directed protocols with point-of-care devices to guide blood product administration and enhanced recovery after surgery (5,6,7,8,9,10,11,12,13). All these therapies have the same aim, which is to optimize intraoperative patient status, which contributes to a favorable postoperative evolution. In our hospital, goal-directed therapies are not yet a routine generalized practice. It is time to reconsider integrating goal-directed therapies in intraoperative patient management in high-risk patients and surgery to improve postoperative outcomes.

Declarations

Conflicts of Interest

The author declared no conflicts of interest

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Tables

Table 1 General characteristics

istics	N=88
in months±standard deviation	98.7±13.8
l surgery n (%)	17(19.3)
gery n (%)	26(29.5)
ic surgery n (%)	45(51.1)
urgery n (%)	77(87.5)
y surgery n (%)	11(12.5)
y n (%)	3(3.4)
vith intra-operative and or postoperative complications (organ failure and or sepsis) n (%)	22(25)
rative hemorrhagic shock n (%)	2(2.3)
rative difficult intubation n (%)	1(1.1)
rative anaphylaxis n (%)	1(1.1)
tive neurologic failure n (%)	9(10.2)
tive cardio-circulatory failure n (%)	2(2.3)
tive endocrinal failure n (%)	1(1.1)
tive miscellaneous n (%)	1(1.1)
tive multi-organ failure n (%)	1(1.1)
tive septicemia n (%)	3(3.4)
tive pulmonary sepsis n (%)	2(2.3)
tive urinary sepsis n (%)	2(2.3)
tive abdominal sepsis n (%)	1(1.1)
l Mortality n (%)	1(1.1)
n n (%)	42(47.7)
operative hemoglobin levels± standard deviation g/dL	11.6±1.9
toperative hemoglobin levels ± standard deviation g/dL	10.9±1.5
%)	3(3.4)
%)	31(35.2)
(%)	40(45.5)
(%)	13(14.8)
%)	1(1.1)
ngth of intensive care unit stay in days [interquartile range]	4[1-6]
ngth of hospital stay in days [interquartile range]	6[3.7-10.2]
tal length of hospital stay in days [interquartile range]	9[5-16]
ngth of mechanical ventilation (invasive or non-invasive) in days [interquartile range]	0[0-1]

Table 2 Surgery

	Number of patients (%)
ıll schwannoma	3(3.4)
m lesion resection	1(1.1)
aneurysm/Cerebral arterio-venous malformation angioembolization	1(1.1)
cavernoma	1(1.1)
malformation	4(4.5)
nostosis	3(3.4)
genic lesion resection	1(1.1)
osteotomy	6(6.8)
prothesis	1(1.1)
tumor	1(1.1)
ɔular thoracic desarticulation	2(2.2)
l resection	5(5.6)
ebral tumor resection	6(6.8)
ɔthesis	1(1.1)
ɔmy for volvulus	1(1.1)
nor resection	8(9.1)
nsplantation	3(3.4)
astoma	1(1.1)
umor	1(1.1)
steotomy	4(4.5)
mor	1(1.1)
fossa decompression	1(1.1)
ınsplantation	4(4.5)
	23(26.1)
omy	1(1.1)
lostomy	1(1.1)
l laminectomy/Arthrodesis	3(3.4)

Table 3 patient with fatal outcome

	Age months	ASA score	Co-morbidities	Intra-operative complications	Postoperative outcome	Delay of in-hospital mortality in days	Emergency	Transfusion
ssa ion	85	5	Sickle cell disease	0	Multiple organ failure and pulmonary sepsis	7	Yes	Yes

Table 4 outcomes per surgery

	Number of patients	Intra-operative anaphylaxis	Intra-operative difficult intubation	Intraoperative hemorrhagic shock	Postoperative cardio-circulatory failure	Postoperative endocrinal failure	Postoperative miscellaneous	Postoperative multiple organ failure	Postoperative neurologic failure	Postoperative abdominal sepsis	Postoperative pulmonary sepsis	Postoperative septicemia	Postoperative urinary sepsis	Re-operation	In-hospital mortality	Transfusion
noma	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
lesion ection	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
erebral erebral venous nation ization	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1
rnoma	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
nation	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ostosis	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
lesion ection	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
otomy	6	0	0	1	0	0	0	0	1	0	0	0	0	0	0	3
othesis	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
tumor	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
oracic ulation	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
ection	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
tumor ection	6	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1
othesis	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
olvulus	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ection	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
ntation	3	0	0	0	1	0	1	0	0	1	0	0	0	1	0	3
ostoma	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
tumor	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
otomy	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
tumor	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
r fossa ression	1	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1
ntation	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
coliosis	23	0	0	1	1	0	0	0	3	0	0	2	0	1	0	9
ectomy	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ostomy	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
rtebral rodesis	3	0	0	0	0	0	0	0	1	0	0	1	0	1	0	2

Table 5 Co-morbidities

bidity	Number of cases (%)
oid cyst	1(1.1)
s	4(4.5)
odysplasia sequelae	1(1.1)
	2(2.2)
al aneurysm/Cerebral arterio-venous malformation, Pulmonary hypertension	2(2.2)
al anoxic lesions	4(4.5)
malformation	2(2.2)
renal failure	4(4.5)
sive encephalopathy	1(1.1)
disease	1(1.1)
y	2(2.2)
sarcoma	5(5.7)
ural hematoma	1(1.1)
syndrome	1(1.1)
failure	4(4.5)
al pseudo-occlusion	1(1.1)
ebral tumor	7(7.9)
Feil Syndrome	1(1.1)
syndrome	1(1.1)
o syndrome	1(1.1)
eningocele	2(2.2)
zing enterocolitis sequelae	1(1.1)
bromatosis	3(3.4)
Robin syndrome	1(1.1)
formation syndrome	4(4.5)
ıma	2(2.2)
notor deficiency	5(5.7)
sm	1(1.1)
osis	1(1.1)
ell disease	1(1.1)
n syndrome	1(1.1)