CONTROVERSIES RELATED TO THE MANAGEMENT OF ANTERIOR ABDOMINAL WALL DEFECTS, OMPhALOCELE AND GASTROSchISIS

Thesis Advisor
Professor PhD MD GOŢIA Dan George

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Key words: Omphalocele, gastroschisis, morbidity, mortality, prognostic factors

The PhD thesis includes:
The general part which comprises 14 chapters; the personal contribution which takes up 5 chapters

The bibliography which includes 323 references; a section with 5 appendices

33 tables and 92 figures were included; the abstract contains only a small number of these tables and figures, which have the same numbers as the ones in the extended thesis

Two ISI-ranked and one B+ ranked papers published, two papers pending publication and two papers sent for assessment

CHAPTER 15. INTRODUCTION

Omphalocele and gastroschisis are the most common types of congenital anterior abdominal wall defects and they will be tackled together in this thesis due to their similar prenatal, obstetrical and postnatal management, despite their different etiopathogeneses, clinical manifestations, associated malformations and prognosis. The incidence of these conditions has been constantly increasing worldwide lately (86, 91) and it continues to be a real challenge for pediatric surgeons around the world. These malformations may be diagnosed relatively easy before the child is born, which means that they may be put on record and even treated during the fetal period. Over the last few decades we have witnessed a spectacular survival rate increase in babies suffering from these conditions (from 10% in 1960 up to 97%-100% survival rate in gastroschisis these last few years), due to early antenatal diagnosis, to the monitoring and therapeutic management of these cases as early as the prenatal period, to their fast referral (in utero or immediately after birth) to specialized pediatric surgery and neonatal intensive care centers, capable of providing state-of-the-art medical and surgical treatment and parenteral nutrition (311). Moreover, the quality of life of these babies, whose prognosis used to be poor, has improved a great deal, the progress being also due to good interdisciplinary cooperation between: obstetricians, ultrasound scanning specialists, neonatologists, anesthesiologists, pediatric surgeons, geneticists and pediatricians. There still are numerous controversies in literature
related to the etiopathogenesis, antenatal diagnosis, birth and then optimal therapeutic management of newborns with omphalocele or gastroschisis, especially in complicated or highly extended cases (231, 312).

**15.1. IMPORTANCE OF THE TOPIC AND MOTIVATION OF THE THESIS**

Almost all the data included in the first part of the thesis were gathered from international literature, since there are very few Romanian papers on congenital anterior abdominal wall defects. Our research will produce real data on local incidence, risk and prognosis factors, diagnosis methods, treatment, survival rates and subsequent course of our patients. We will compare our results with those in literature and we might even suggest some solutions to improve the disease outcome. This paper will attempt to emphasize the importance of education and family planning, of antenatal diagnosis, of childbirth in specialized centers and under different types of anesthesia, of customized medical and surgical treatment, and also of the material resources available in “Sfânta Maria” Emergency Children’s Hospital of Iași.

**CHAPTER 16. MATERIAL AND METHODS**

We conducted an analytical retrospective (covering about 20 years) and prospective (the last 3 years) study, between January 1990 and September 2009, and September 2009 and September 2012, respectively, on all the babies with omphalocele and gastroschisis hospitalized in the Pediatric Surgery Department of “Sfânta Maria” Emergency Children’s Hospital of Iași. We analyzed the demographic data, parents’ age and social status, family medical history, whether the pregnancy was monitored by specialists and whether an antenatal diagnosis was set, the type of childbirth, gestational age, birth weight and Apgar score, associated malformations, immediate postnatal management and conditions of transfer to our hospital, child’s age and general state upon hospitalization, medical and surgical management in the specialized
center, postoperative and distance complications, causes of death, length of hospitalization, short- and medium-term course of disease. All the data were analyzed separately for the omphalocele and gastroschisis patients, and the results of the two categories of patients were compared between them and then with the data in literature.

CHAPTER 17. RESULTS

17.1. CLINICAL IMPLICATIONS

We analyzed 114 cases of gastroschisis and 105 cases of omphalocele. 24 cases of gastroschisis were complex, according to Molik’s classification: associated with atresia or intestinal stenosis, ischemia, necrosis or intestinal volvulus (Fig. 1), whereas the remaining 90 patients suffered from simple gastroschisis (Fig. 2). Depending on their extent, the omphalocele cases were divided into: small omphalocele - 28 cases (Fig. 4), medium-sized omphalocele - 40 cases, giant omphalocele - 30 cases (Fig. 7), and 7 cases of omphalocele with ruptured membranes.

Fig. 1. Gastroschisis with necrosis of the protruding loop and underlying ileal atresia
Fig. 2. Simple gastroschisis
17.2. DEMOGRAPHIC DATA

The calculation of the incidence of anterior abdominal wall malformations in the demographic area called North-Eastern Romania is shown in table I, which reveals a slightly ascending trend of the incidence of these malformations and a significant decrease of the total number of born-alive infants.

Table I. Incidence of anterior abdominal wall malformations in Moldova

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NO. OF BORN-ALIVE INFANTS</th>
<th>GASTROSCHISIS</th>
<th>OMPHALOCELE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO. OF CASES</td>
<td>%000</td>
<td>NO. OF CASES</td>
</tr>
<tr>
<td>1990</td>
<td>63582</td>
<td>4</td>
<td>0.63</td>
</tr>
<tr>
<td>1995</td>
<td>49368</td>
<td>2</td>
<td>0.41</td>
</tr>
<tr>
<td>2000</td>
<td>50005</td>
<td>9</td>
<td>1.80</td>
</tr>
<tr>
<td>2005</td>
<td>43656</td>
<td>5</td>
<td>1.15</td>
</tr>
<tr>
<td>2010</td>
<td>42440</td>
<td>5</td>
<td>1.18</td>
</tr>
</tbody>
</table>

For gastroschisis, the mean gestational age (GA) was 36.5±2.6 weeks, 42.1% of the infants being premature < 37 weeks. Their mean birth weight (BW) was 2329.2±464.2 grams, 64.9% of the infants weighing less than 2500 grams (LBW). As concerns omphalocele, the mean GA was 37.1±3.0 weeks, 28.5% being premature; the mean BW was 2717.2±702.0 grams, 35.2% LBW. Only 11.4% of the
gastroschisis cases (n=13) and 13.3% of the omphalocele cases (n=14) were diagnosed before their birth. 19.2% of the gastroschisis cases and 27.6% of the omphalocele cases were delivered by Caesarian section. The parents’ age is shown in Fig. 15. 65.7% of the mothers of gastroschisis babies were primigravida and primipara, as compared to only 34.2% in omphalocele, and 50.4% of the mothers of omphalocele babies were multipara; 40% of the mothers of gastroschisis babies were single as compared to only 22% of the mothers of omphalocele babies, whereas alcohol and tobacco consumption by parents was 15% in gastroschisis as compared to 32% in omphalocele. 41.2% of the mothers of gastroschisis babies were under 20, and 27.6% of the mothers of omphalocele babies were over 30. The mothers’ level of education was slightly higher in omphalocele. 31.5% of the babies with gastroschisis and 38% of the babies with omphalocele, respectively, came from urban areas. The gender ratio was 1.37 male/female for gastroschisis and 1.38 for omphalocele.

![Graph showing age of parents](image)

Fig. 15. Age of parents of babies with gastroschisis and omphalocele

**17.4. ASSOCIATED MALFORMATIONS**

Three (2.6%) of the gastroschisis patients and 29 (27.6%) of the omphalocele patients also suffered from chromosomal aberrations: 7 patients with Down syndrome, 7 with trisomy 18 (Fig. 22), 3 with trisomy 13 (Fig. 23), one with trisomy 1, 2 with
Beckwith-Widemann syndrome and 9 with other genetic abnormalities. In our study, the male/female ratio of the “syndrome” omphalocele cases was 1.11. 71.4% of the 105 omphalocele patients also suffered from several associate congenital abnormalities. The frequency of congenital abnormalities and malformations associated with the two types of anterior abdominal wall defects under survey here is shown in table V.

![Fig. 22. Trisomy 18](image1)

![Fig. 23. Trisomy 13](image2)

**Table V. Abnormalities associated with anterior abdominal wall defects**

<table>
<thead>
<tr>
<th>Abdominal wall defect</th>
<th>Chromosomal aberrations</th>
<th>Intestinal abnormalities (including esophagus)</th>
<th>Cardiac abnormalities</th>
<th>Skeletal abnormalities</th>
<th>Kidney abnormalities</th>
<th>Congenital undescended testis</th>
<th>Other abnormalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrochisis</td>
<td>2.6%</td>
<td>13.2%</td>
<td>7%</td>
<td>3.5%</td>
<td>6.1%</td>
<td>3.5%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Omphalocele</td>
<td>27.6%</td>
<td>7.6%</td>
<td>31.4%</td>
<td>23.8%</td>
<td>16.1%</td>
<td>15.2%</td>
<td>47.6%</td>
</tr>
</tbody>
</table>
17.5. NEWBORN TRANSPORTATION

The transportation conditions of newborns with anterior abdominal wall defects to specialized pediatric surgery centers must comply with particular requirements, which were actually observed in only 60% of the gastroschisis cases and 78% of the omphalocele cases. If one analyzes the newborn transportation conditions from the viewpoint of the patient’s survival or death, one notices that 30% versus 44% of the surviving gastroschisis babies were transported in improper conditions as compared to the ones that died, and 12.5% versus 30% of the omphalocele babies, respectively.

17.6. STATISTICAL CORRELATIONS

Mother’s age – Antenatal diagnosis: Although there is a difference of about one year between the mean ages of the mothers of babies diagnosed before birth and those of the mothers of undiagnosed babies, both in gastroschisis and in omphalocele, these differences are not statistically significant.

Marital status – Antenatal diagnosis: 40% of the mothers of gastroschisis babies and 22% of the mothers of omphalocele babies were single. However, this does not influence their coming to the doctor and their antenatal diagnosis, respectively (p=0.122).

Living conditions – Antenatal diagnosis: 31.5% of the babies with gastroschisis and 38% of the babies with omphalocele, respectively, came from urban areas. The antenatal diagnosis rate is double in urban infants than in rural infants, which is statistically significant (p=0.046).

Antenatal diagnosis – Premature birth: An antenatal diagnosis of anterior abdominal wall defect determined the obstetrician to prefer the term birth of a gastroschisis baby (p=0.038), and it did not influence the GA of omphalocele babies (p=0.525).

Antenatal diagnosis – Type of birth: The analysis of the whole group of patients revealed that infants with antenatal diagnosis of anterior abdominal wall were delivered mainly by Caesarean section (p=0.0001).
Antenatal diagnosis – Apgar score: The fact that some of the infants were diagnosed with anterior abdominal wall before their birth did not influence the Apgar score either in the group as a whole (p=0.407) or separately, on conditions.

Antenatal diagnosis – Age on hospitalization: When analyzing the age on hospitalization of the antenatal diagnosis patients (as a whole), we note a significant difference of about 3 hours in favor of the latter (4.64 versus 7.96 hours, p=0.015). This difference is only one hour (4.14 hours versus 5.09 hours on the average), (p=0.489) in gastroschisis infants. In omphalocele, this difference is about 6 hours (5.10 versus 11.14 hours), p=0.023.

Antenatal diagnosis – Days of hospitalization: Antenatal diagnosis patients were hospitalized for a longer period of time (p=0.044) than the undiagnosed ones, which may be accounted for by the high early death rate in the latter group.

Antenatal diagnosis – Death: Only 27 of the 219 patients were diagnosed before their birth, and their survival rate was significantly higher (55.6% versus 34.9%, p=0.038).

17.7. MANAGEMENT OF ANTENOR ABDOMINAL WALL DEFECTS, OMPHALOCELE AND GASTROCHISIS

17.7.1. GASTROCHISIS

Gastroschisis is an anterior abdominal wall defect through which the intestinal loops, stomach, sometimes spleen and even urinary bladder or fallopian tubes and ovaries may protrude (Fig. 33). In 47.3% of the cases only the intestinal loops protruded. Among the cases included in our research there were four gastroschisis patients with protruding liver (3.5%), in three of them only the left liver lobe protruded and in the fourth the entire liver was sticking out (Fig. 35). The overall survival rate in the group of 114 patients with gastroschisis was 29.8%. The analysis of the survival rates of gastroschisis patients depending on antenatal diagnosis reveals a statistical significance: 61.5% survival rate among patients with antenatal diagnosis versus 25.7%, p=0.008. The
mean age on hospitalization was 4.98 hours, but when analyzing survivors separately from deceased patients we notice a 1.5 hour difference (3.96±2.3 hours versus 5.42±5.2 hours in deceased babies), (p=0.089). The mean number of hospitalization days on first hospitalization was 30.79±19.0 days, i.e. 43±29.3 days on the whole.

When we considered all the gastroschisis patients included in the research, we achieved a mean number of first hospitalization days of 17.60±20.31 days. We conducted a statistical analysis of the influence of certain factors on the hospitalization time:

- Type of birth: babies delivered by Caesarian section were hospitalized 18.97±16.33 days versus the 17.28±21.22 days of hospitalization of naturally delivered babies, p=0.727;
- GA: premature babies were hospitalized 15.86±21.0 days versus the 18.87±19.86 days of hospitalization of full-term babies, p=0.437;
- BW: low birth weight babies (<2500 grams) had a significantly shorter hospitalization time than normal weight babies, i.e. 13.71±18.73 versus 24.81±21.37 days, with a p=0.005; yet, this difference is accounted for by the high death rate of low birth weight patients, i.e. 81% versus 50% mortality rate. Low birth weight was actually a negative prognosis factor on the subsequent course. When analyzing only the surviving patients, low birth weight infants had a
mean number of hospitalization of days of 27.85±15.39 as compared to the 32.85±21.45 days of the other infants, (p=0.435).

About 2 hours elapsed on the average between their hospitalization in our clinic and the actual surgery, which means that the infant’s age on the first surgical procedure was 7.18±5.0 hours: 5.88±2.4 hours on the average for survivors versus 7.82±5.6 hours for deceased patients (p=0.012). A delayed surgical procedure was one of the factors with a negative influence on the final prognosis of these patients. The surgical procedure was performed in the operating room, under general anesthesia, where the eviscerated organs were surgically clean and the intestinal loops were checked. If they looked supple and no atresia, intestinal stenosis, loop perforations or necrosis was detected, the gastroschisis was said to be simple; otherwise, the gastroschisis was considered complex. The mortality rate in the group of patients with complex gastroschisis was 66.7%, versus 71.1% in the group of patients with simple gastroschisis. When analyzing the hospitalization time of the surviving patients depending on the complexity of their gastroschisis, we noticed an important difference: 42.87 days in complex gastroschisis patients versus 27.07 days in simple gastroschisis patients (p=0.201). 20 of the 24 patients with complex gastroschisis (83.3%) underwent concomitant surgical procedures such as ileostomas, colostomas, intestine resections and anastomosis. Additional surgical procedures were applied to 9 (37.5%) of these patients due to their post-operative complications. A quarter of the complex gastroschisis patients suffered from the short intestine syndrome after the surgical procedures, and only one of these 6 patients survived. Only 10 (11.1%) of the simple gastroschisis infants required further surgery. Abdominal compartment syndrome as one of the main causes of post-operative death occurred in 11.1% of the simple gastroschisis patients (as compared to zero complex gastroschisis patients). The treatment of all these patients consisted of primary integration and per primam abdominal wall closing.

Full viscera integration in the peritoneal cavity was achieved in 90 of the 114 patients (79%), and the abdominal wall defect was
closed per primam in 56 patients, by means of an umbilical cord patch (“Fufezan” method - Fig. 46) in 18 babies and by the Gross method in 16 cases. In 24 patients (21% of the total number of patients) the extent of the visceral-abdominal disproportion required the use of the Schuster method. Since no high performance “silo bag” medical device is available in our hospital, it was replaced by prolene sutures, sterile or collector surgical glove made of sterile plastic (Fig. 48).

The primary closing of the anterior abdominal wall defect was done whenever possible. The Bianchi method was performed in 2 patients, which consisted of manual viscera integration in the abdomen, in the incubator, without general anesthesia, during the first two hours of life. The evolution of the two patients was excellent, as they experienced no complications.

When analyzing the patients’ post-operative course depending on the two main types of surgical approach (primary closing - 90 patients, versus Schuster’s method - 24 patients), we noticed a 11.4% difference between the survival rates, in favor of the primary closing (p=0.279) (Fig. 56).
Only 34 of the 114 gastroschisis infants survived, and they were treated by the following surgical approaches: intestinal loop integration and per primam closing -21 cases, Gross method -3 cases, Fufezan -5 cases, Schuster -5 cases. Various complications occurred post-operatively: hydro-electrolytic disorders, broncho-pneumonia, acute kidney failure, enterocolitis (36.8%) (Fig. 58), abdominal compartment syndrome (Fig. 59), suppurating wound with dehiscence, eviscerations, eventrations (Fig. 60), occlusions, synthetic suture displacement, anastomosis disunion, volvulus, in 87 of the 114 patients (76.3%). 22 patients (19.2%) undergone further surgery for post-operative complications.
The overall sepsis rate in the 114 gastroschisis patients was 61.4%. A necroptic examination was performed in 64 of the 80 patients (80%) (Fig. 62).

We tried to detect the influence of some personal factors (GA, BW, type of birth, complexity of the case), or the surgical approach or of the occurrence of sepsis on the postoperative course. The group of patients with complicated course included the deceased patients and those who required further surgery due to postoperative complications. We achieved the following results:

- The percent of complicated postoperative courses is significantly lower in Cesarean section than in natural deliveries (p=0.034).
- The postoperative complications rate is 10% higher in premature than in full-term babies (p=0.133).
- Low birth weight babies show a high complications percentage, i.e. over 30% higher than normal weight babies (p=0.000).
- The occurrence of intestinal atresia is associated with a postoperative complications rate that is 11% higher than in patients who do not have this condition. Compromised intestinal loops by ischemia or necrosis processes (complex gastroschisis) favored a complicated postoperative course in 87.5% of the patients, as
compared to 73.3% in patients with uninjured intestinal loops (simple gastroschisis), p=0.147.

- The intestinal loops reintegration method and the type of anterior abdominal wall closing are important factors in the patient’s immediate postoperative course. For data comparison purposes, we grouped the patients in two categories with approximately the same number of individuals: on the one hand, the patients with primary integration and per primam abdominal wall closing and, on the other hand, the patients having undergone the Gross, Fufezan and Schuster methods. We noted a complications occurrence rate that was by more than 15% lower in the primary closing group than in the other patients or, in other words, a good postoperative course that was double in primary closing than in the other patients (32.1% versus 15.5%, p=0.037).

- Sepsis is an important negative prognosis factor that influences the postoperative course of patients who experience a complications rate that is three times higher (p=0.001).

Another approach used to detect the factors with a significant influence on the postoperative course of the patients consists of the creation of a regression model able to determine the independent variables influencing the dependent variable. We determined a total of three predictors through statistical confirmation (Table XXVI). In conclusion, a LBW triggers a higher risk (17.4 times higher) of postoperative complications. Sepsis increases by 12.2 times the risk of complicated postoperative course, whereas the occurrence of compromised intestinal loops (complex gastroschisis) increases that risk 5.5 times.
Table XXVI. Variables with significant influence on the patients’ postoperative course

Variables in the Equation at step 3

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I. for EXP(B)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Weight</td>
<td>2.861</td>
<td>.708</td>
<td>16.315</td>
<td>1</td>
<td>.000</td>
<td>17.483</td>
<td>4.362</td>
<td>70.077</td>
<td></td>
</tr>
<tr>
<td>Compromised intestinal loops</td>
<td>1.705</td>
<td>.883</td>
<td>3.731</td>
<td>1</td>
<td>.053</td>
<td>5.500</td>
<td>.975</td>
<td>31.011</td>
<td></td>
</tr>
<tr>
<td>SEPSIS</td>
<td>2.508</td>
<td>.692</td>
<td>13.152</td>
<td>1</td>
<td>.000</td>
<td>12.281</td>
<td>3.166</td>
<td>47.631</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-1.905</td>
<td>.690</td>
<td>7.619</td>
<td>1</td>
<td>.006</td>
<td>.149</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The nasogastric intubation was maintained in all the gastroschisis patients and their exclusive parenteral feeding was not discontinued during the first few days after the surgery. **Full enteral feeding** was achieved in all the 34 surviving patients not earlier than 7 days and not later than 39 days after the surgery, i.e. after 22.61±8.5 days on the average. The occurrence of compromised intestinal loops (**p=0.013**), intestinal atresia (**p=0.027**) and sepsis (**p=0.012**) are significant influence factors, as they delay the onset of full enteral feeding of babies with gastroschisis. Although all the patients were administered a mixture of at least two broad-spectrum antibiotics from the very beginning of their hospitalization, 41.1% of the survivors and 70% of the deceased babies suffered from severe **sepsis** caused by hospital germs.

The **mean hospitalization time** calculated for the whole group of gastroschisis patients, i.e. 17.60±20.31 days, was significantly influenced (**p=0.040**) only by the occurrence of sepsis. When analyzing the mean number of hospitalization days on first hospitalization of the 34 **surviving** patients, we noticed that the 30.79±19.09 days were significantly influenced only by the occurrence of sepsis (40.00 **versus** 24.35 days, **p=0.016**). The type of birth (**p=0.368**), GA (**p=0.782**), BW (**p=0.435**), surgical approach (**p=0.758**), occurrence of compromised intestinal loops (**p=0.201**) or of intestinal atresia (**p=0.236**) had no influence on the hospitalization
time. The analysis of the group of patients from the viewpoint of the year of their hospitalization revealed that the survival rate was 24% before 2000 and increased to 34.4% after the year 2000. Only 25 of the 34 surviving gastroschisis infants (73.5%) came for follow-up at least once, 19 of whom had a positive course (76%), as they reached a normal weight and height by the time they turned one year (Fig. 66). The other 6 experienced recurrent episodes of digestive intolerance and occlusions due to agglutination and ileal bundles, 3 of whom required further surgery, and thus suffered slight neuro-psycho-motor acquisition deficiencies and moderate failure to thrive (Fig. 67).

Fig. 66. Normal development of a 1.8 year old gastroschisis child

Fig. 67. Delayed neuro-psycho-motor development and failure to thrive – 3 year old child

17.7.2. OMPHALOCELE
The size of the abdominal wall defect in infants with omphalocele was 6.20±3.24 cm in survivors and 7.01±3.96 cm in deceased patients (p=0.252). The distribution of the cases of omphalocele in the two groups of patients, namely survivors and
deceased patients, depending on the size of the omphalocele, is shown in figures 68 and 69. All the 7 cases of ruptured omphalocele cases had a negative course (Fig. 70). The omphalocele was considered small (2 - 4 cm), medium (4 - 8 cm) (Fig. 72) or giant if its basis was ≥ 8 cm.

![Fig. 68. Distribution of surviving patients depending on the size of the omphalocele](image1)

![Fig. 69. Distribution of deceased patients depending on the size of the omphalocele](image2)

![Fig. 70. Ruptured omphalocele](image3)

![Fig. 72. Medium omphalocele](image4)

38% of the patients diagnosed before their birth, i.e. 9 out of 14, came from urban areas (p=0.030). 42.1% of the deceased patients had chromosomal aberrations and 85.9% other associated congenital malformations, versus 10.4% chromosomal aberrations...
and 56.3% associated malformations in the group of surviving patients. 71.4% of the 105 patients with omphalocele had one or more associated congenital abnormalities.

The survival rate in the group of 105 patients with omphalocele was **45.7%**. The age on hospitalization was 10.33 hours, but when analyzing the survivors separately from the deceased patients one notices a difference of 9.45 hours in advance for the deceased (15.46±31.0 versus 6.01±6.5 hours) (p=0.043). This may be accounted for by the greater severity of the illness in the deceased patients and hence their faster referral to the pediatric surgery ward. When analyzing the age on hospitalization, one notes a 6 hour difference (p=0.023) in favor of the patients diagnosed before their birth (5.10 versus 11.14 hours). The mean number of days of hospitalization of survivors on their first hospitalization was 23.47±20.6 days and 31.27±28.7 days overall.

58 patients (55.2%) underwent surgery, which consisted of omphalocele membrane resection, intestinal loops integration in the peritoneal cavity and per primam closing of the abdominal wall defect, umbilical plasty. In 49 of the cases (84.4%), the defect was covered with advanced tegument flaps taken from the flanks (Gross technique). In 5 cases (Fig. 80), the viscera were progressively integrated by the resection of the side of the omphalocele bag and by defect covering through tegument bag sutures (Fufezan technique) in 2 cases, and in 2 other cases the Schuster technique was preferred (Fig. 81). Half of the 58 omphalocele infants who underwent surgery at the beginning survived and the other half died. Other concomitant surgical procedures were also performed in 18 of the patients, but only 8 survived.
Six (10.34%) of the 58 patients who underwent immediate surgery had **postoperative complications**, yet they did not require additional surgery. The mean number of **hospitalization** days on the first hospitalization of the patients operated on was 14.00±12.44 days (overall); for the 29 survivors, this was 14.20±6.73 days and 17±11.02 days overall.

A **conservative** approach was preferred for the other 47 patients with omphalocele, due to their severe associated malformations (6 cases), chromosomal aberrations incompatible with life (2 cases) or large-sized omphalocele (39 cases). The conservative therapy was performed according to the Grob method and consisted of patient monitoring and surveillance in the neonatal intensive care ward, daily omphalocele membrane disinfection using antiseptic solutions, sterile silver sulfadiazine dressings, antiseptic fatty ointments, smears with mercurochrome 1% solution, Videne or other healing and epithelializing agents. The patient was administered prophylactic antibiotic therapy specific to tegument flora or antibiotic therapy according to antibiotic susceptibility tests. The marginal epithelialization process progressed and within 2 to 4 weeks the abdominal viscera were covered by a newly formed tegument, which turned the omphalocele in a ventral hernia (Fig. 85, 89). Only 19 (i.e. 40.4%) of the 47 omphalocele patients treated by the conservative approach **survived**. 10 of these 19 patients underwent further surgery in our clinic for straight abdominal muscle dehiscence rehabilitation. We lost track of the other 9 (5
patients), the abdominal wall defect closed spontaneously and required no further surgery (2 patients) or they were operated on in other pediatric surgery clinic (2 patients). In these 19 patients, the **mean number of hospitalization days** on first hospitalization was 37.63±26.36, and 53.05±33.82 days overall.

Fig. 85. Ventral hernia  
Fig. 89. Inguinal-scrotal hernia in patient with giant omphalocele treated by the conservative approach

The number of hospitalization days of surviving patients was smaller when surgical procedures were performed than when a conservative approach was preferred, both on their first hospitalization (**p=0.001**) and overall (**p=0.0002**). Nevertheless, the patients that underwent surgery started their enteral feeding later, i.e. after 3.9 days, and they achieved full enteral feeding after 9.2 days, as compared to the 2.6 and 8.3 days, respectively, in patients in whom the conservative approach was preferred (**p=0.07** and **p=0.54**, respectively). The overall survival rate in the group of 105 patients with omphalocele was 45.7%. The occurrence of abnormalities and **associated congenital malformations** was significantly lower (**p=0.024**) in the surviving than in the deceased patients (table XXIX). Since omphalocele patients also associate abnormal
insertion and straight abdominal muscle hypotrophy, which results into low intra-abdominal pressure both in the uterus and after birth, we found high cryptorchidism (7.4%) and inguinal-scrotal hernia (29.6%) occurrence rates in surviving omphalocele patients (Fig. 89).

Table XXIX. Occurrence rates of omphalocele-associated abnormalities

<table>
<thead>
<tr>
<th>COURSE</th>
<th>CHROM. ABERR.</th>
<th>CARDIAC ABNO RM.</th>
<th>INTES T. ABNO RM.</th>
<th>SKELETAL ABNO RM.</th>
<th>RENAL ABNORM.</th>
<th>DVLP</th>
<th>EXTROFIA</th>
<th>OTHER MALFORMATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECEASED</td>
<td>42.1%</td>
<td>43.8%</td>
<td>12.2%</td>
<td>36.8%</td>
<td>21.0%</td>
<td>15.7%</td>
<td>8.7%</td>
<td>50.8%</td>
</tr>
<tr>
<td>SURVIVORS</td>
<td>10.4%</td>
<td>16.6%</td>
<td>2.0%</td>
<td>12.5%</td>
<td>10.4%</td>
<td>2.0%</td>
<td>0%</td>
<td>35.4%</td>
</tr>
</tbody>
</table>

Although all the patients were administered at least one broad-spectrum antibiotic from the very beginning of their hospitalization, 16.6% of the survivors and 54.3% of the deceased babies suffered from severe sepsis caused by hospital germs (37.1% of the total number). The most common germs found in the patients whose cultures were positive were Klebsiella pneumoniae, Staphilococcus sp, Pseudomonas aeruginosa, Candida spp.

The analysis of the group of patients from the viewpoint of the year of their hospitalization revealed that the survival rate was 47.9% before 2000 and dropped to 43.9% after the year 2000. Once the feeding of the 29 patients that underwent surgery was fully enteral and once the omphalocele bag of the 19 patients that received conservative therapy was satisfactorily covered by newly formed epithelium, the survivors were discharged from hospital. Only 31 of the 48 surviving omphalocele infants (64.5%) came for follow-up at least once, 28 of whom had a positive course (90.3%), as they reached a normal weight and height by the time they turned 6-7 months. The other 3 experienced recurrent episodes of digestive intolerance, constipation and intestinal occlusions due to agglutination and ileal bundles (none of them required further surgery), and thus suffered moderate failure to thrive. Two of them have Down’s syndrome.
CHAPTER 18. DISCUSSIONS

Higher incidence and prevalence rates of anterior abdominal wall defects, especially gastroschisis, have been reported worldwide lately. Omphalocele incidence is 1-3.69/10000 newborns, whereas gastroschisis incidence ranges between 0.5 and 5.99/10000 newborns (83). There are many epidemiological studies that confirmed gastroschisis recrudescence in all the areas under survey (86-89); on the other hand, worldwide omphalocele incidence seems to remain stable in time (86). Our study reveals a slightly ascending trend in both gastroschisis and omphalocele incidence. Gastroschisis incidence increase may be accounted for by demographic factors changes, such as the parents’ and especially mothers’ young age, poorer standard of living, smoking and drug abuse extension, abuse of other pharmaceuticals and vasoconstrictive agents during the pregnancy, radiations or other environmental factors.

Many studies have revealed poor gastroschisis occurrence in males, with a peak of 1.68 reported by Torfs in 1994 (69). As far as “syndrome” omphalocele is concerned, males prevail in all types of associated abnormalities, except for neural tube defects (85). In our study, the gender ratio was 1.37 male/female for gastroschisis and 1.38 for omphalocele. As for “syndrome” omphalocele, our study supports literature data, with a male/female ration of 1.11.

The mean age of the mothers of gastroschisis infants was 20.6±3.3 years, which is in agreement with Suita’s research conducted in 2000, where the mean age was 20.6±4.9 years (91). Most authors argue that the mothers’ young age (under 20) is a gastroschisis risk factor (103). In our study, the mean age of the mothers of omphalocele babies was 27.0±6.7 years, the mother’s advanced age being a risk factor for the occurrence of this malformation (102), which may be explained by the higher incidence of chromosomal incidence. The mean age of the mothers of omphalocele infants is higher than that of the mothers of gastroschisis infants (91), the approximately 6-year difference being also supported by our study. Primiparity is a risk factor for both omphalocele and gastroschisis: 65.7% of the mothers of
gastroschisis babies were primigravida and primipara, as compared to only 34.2% in omphalocele, and 50.4% of the mothers of omphalocele babies were multipara (another omphalocele risk factor (111)). According to Axt’s study, primiparity occurred in 70% of the mothers of omphalocele girls and in 89% of the mothers of gastroschisis girls (110).

As far as gastroschisis is concerned, the percent of postoperative complications was higher in naturally delivered babies (p=0.034), and low birth weight babies showed a high complications percentage, i.e. over 30% higher than normal weight babies (p=0.0001). The mean GA of 36.5 weeks at the time of birth (versus 259 days, i.e. 37 weeks), the BW of 2329.2 grams (versus 2490 grams), the frequency of associated malformations, the 80.8% rate of vaginal deliveries (versus 74%) and even the actual therapeutic approach, the Schuster method was used in 21% of the cases (versus 19%), are similar to a Dutch study conducted in 2007 on 59 gastroschisis cases (313), less the antenatal diagnosis rate (11.4% versus 68%), prompt referral and surgery (7.18 hours versus 4.3 hours), and, the most critical, high infection rate (61.4% versus 38%) and hence high mortality rate (70.2% versus 7%), which were significantly different. The low antenatal diagnosis rate revealed by our study delayed the infant’s referral to specialists, delayed adequate surgical therapy and subsequent monitoring in the intensive care unit, which favored infections.

As for omphalocele, the mean GA was 37.1±3.0 weeks, meaning that only 28.5% were premature, the mean BW was 2717.2 grams, i.e. 35.2% had low birth weight. A study conducted in Japan on 52 omphalocele babies diagnosed before their birth, only 38 of whom were born alive, revealed a 55.3% prematurity rate and a mean birth weight of 2148 grams (158).

The decision of premature delivery of a fetus diagnosed with anterior abdominal wall malformation has been a highly controversial matter in literature, especially when gastroschisis is involved. Some authors find no negative correlation between premature delivery and the course of gastroschisis babies. On the contrary, they even recommend premature delivery, after 36-37
weeks of gestation, by Cesarean section to prevent chemical peritonitis injuries (“peel”) from occurring in the last weeks of pregnancy or during delivery (217). Our study revealed a statistically positive correlation between antenatal gastroschisis diagnosis and birth as close to the term as possible, by Cesarean section. There are, however, studies drawing our attention to the negative implications of prematurity, especially in an inadequate neonatal intensive care unit, which support the superior prognosis of full-term babies (169, 220).

An increasingly number of infants with congenital malformations profit from antenatal diagnosis, and therefore each time an obstetrician discovers any fetal abnormality by ultrasound scanning, the parents should be entitled to a multidisciplinary antenatal examination (195). If other associated abnormalities are detected or if the malformation may be attributed to a particular genetic syndrome, the fetus’ prognosis may be poor and the parents may consider an induced termination of pregnancy (197), although, ethically speaking, this decision is a highly controversial matter. In our study, the antenatal diagnosis rate was as low as 11.4% for gastroschisis and 13.3% for omphalocele, despite the fact that in most European countries these rates exceed 70-80% (100, 299). According to the findings of our study, 40% of the mothers of gastroschisis babies were single as compared to only 22% of the mothers of omphalocele babies, whereas alcohol and tobacco consumption by parents was 15% in gastroschisis as compared to 32% in omphalocele. The mothers’ level of education was slightly higher in omphalocele (27% of them were illiterate or have only gone to primary school versus 40%), and they were also older. 41.2% of the mothers of gastroschisis babies were very young, i.e. under 20, and 65.7% of them were primigravida and primipara. 68.5% of the babies with gastroschisis and 62% of the babies with omphalocele, respectively, came from urban areas. The antenatal diagnosis rate is double in urban infants than in rural infants, which is statistically significant. Studies focusing on socio-economic factors report higher omphalocele and gastroschisis risks in underprivileged mothers (115, 116), and a poor course of the
condition. In our study, the mortality rate was extremely high, namely 70.2% in gastroschisis and 54.3% in omphalocele, as compared to rates of 0-10% in developed countries (139, 299). Despite the poor conditions of the Romanian healthcare system, which is deprived of many basic materials, the antenatal diagnosis of congenital malformations is associated with positive results: thus, the survival rate of patients with an antenatal gastroschisis diagnosis was 61.5% versus 25.7% (p=0.008), and 55.6% versus 34.9% (p=0.038) overall. Higher antenatal diagnosis rates of severe chromosomal aberrations or congenital malformations associated to anterior abdominal wall defects (in our study, 27.6% of the omphalocele cases were accompanied by chromosomal aberrations, and the survival rate in case of syndromic omphalocele was as low as 17.2%) may result into a therapeutic abortion decision meant to protect the families involved against the unwanted psychological effects of giving birth to a baby suffering from multiple malformations, which would put a considerable financial burden on pediatric surgery wards for the somewhat hopeless treatment of these babies and which would remove these guarded prognosis patients from further studies, thus leading to an increase in the survival rates.

There are many papers currently assessing the psychological impact of antenatal diagnosis on the expectant parents (149, 195, 196, 199, 200). Both family planning and pregnancy are normally considered happy times for the family, but when a fetal condition is detected prenatally, the time left until the baby’s delivery is one of stress and uncertainty for the couple. Marteau suggests that immediate and long-term suffering caused by knowing about the occurrence of a congenital malformation may be reduced by the parents’ adequate preparation before the test, and especially by support, by post-test counseling and the provision of information as complete as possible (202). Although anterior abdominal wall anomalies have better prognosis than other congenital malformations, such a diagnosis may have a negative psychological impact on the parents and an unfortunate influence on their future reproduction decisions. At the same time, considered from the viewpoint of the rights of the parties involved, prenatal diagnosis is
an ethical and legal must, which carries a twofold meaning: recognition of the women’s right to abortion and, on the other hand, recognition of the fetus’ right to life and protection (316, 317).

The congenital malformation and associated chromosomal aberration rates (with postnatal detection in our study) were comparable to literature data in both omphalocele and gastroschisis. The latter data varied depending on the time of diagnosis setting, i.e. whether during the fetal or during the postnatal period. The malformations and abnormalities associated to anterior abdominal wall defects significantly impair on their pre- and postnatal prognosis by adding their own morbidity and mortality burden to an already difficult treatment. Associated malformations should be looked for systematically, as they occur in 10 to 91% of the cases (85, 110, 126), depending on the analyzed groups. In our study, 42.1% of the deceased omphalocele patients also suffered from chromosomal aberrations, whereas 85.9% of them had other associated congenital malformations. In 5-25% of the cases, gastroschisis is also associated with atresia and intestinal stenosis (13.2% in our study), which may be simple or layered, and which contribute to significant morbidity and mortality rates. The numerous studies published over the last few years have proven that the mortality rate of congenital anterior abdominal wall abnormalities decreased to 6-7% in gastroschisis, being closely connected to the occurrence of associated atresia and intestinal complications. Nevertheless, these excellent results were reported in developed countries, where the antenatal diagnosis rate exceeds 60% (69% for omphalocele and 88% for gastroschisis in Germany), which allows for the best possible baby delivery planning and medical and surgical management (299). Unfortunately, the mortality rate is still high in most developing countries, being about 20% in omphalocele and as high as 80% in gastroschisis (300). In literature, morbidity and mortality are higher in complex gastroschisis (81). An interesting result of our research was the relatively equal mortality rates of the simple and complex gastroschisis neonates, which were 71.1% and 66.7%, respectively. This may be accounted for by the absence of the abdominal
compartment syndrome in complex gastroschisis patients, who suffered visceral mass diminution due to atresia, necrosis and necessary intestinal resections. A quarter of the complex gastroschisis patients suffered from the short intestine syndrome after the surgical procedures, and only one of these 6 patients survived, as intestinal transplantation is not done in Romania. Although most specialized publications claim that liver protrusion is only specific to omphalocele, there are authors who describe cases of gastroschisis with protruding liver, while admitting the extreme complexity of these cases and their usually unfortunate prognosis (318). A 2011 study conducted on a group of 117 gastroschisis cases reports a 6% incidence of protruding liver cases and a 43% survival rate of these patients as compared to 97% in the other gastroschisis patients (319). In our research, we came across 4 cases of gastroschisis with liver herniation (3.5%). Although the extent of visceral-abdominal disproportion was considerable and the cases were obviously complex (all the patients died), since no intestinal atresia or perforations were associated, according to Molik’s classification (81), they were included in the simple gastroschisis group, thus increasing the mortality rate in this. According to various authors, depending on the period and location of the study, hospitalization varies between 10 and 50 days for simple gastroschisis and around 162 days for complex gastroschisis, i.e. about 42 overall days on the average (302); in our study, the results concerning the survivors were good: 27.07 days for simple gastroschisis and 42.87 days for complex gastroschisis.

The abdominal compartment syndrome occurring after primary abdominal wall closing was fairly common. Also, 9 of the 10 patients died. Primary closing complications may be minimized by objective intra-abdominal pressure measurements before and after the surgery (320). When intra-abdominal pressure is impossible to measure, the surgeon may resort to covering the abdominal wall defect with a patch from the baby’s umbilical cord, a readily available material which allows peritoneal cavity volume increase. This has very good results (252). In these cases, the residual hernia rate may vary between 60 and 84%, yet most of them close
spontaneously (251). In our study, 15.78% of the gastroschisis patients had their abdominal wall defect covered with an umbilical cord patch, and the postoperative results were similar to those of other surgical methods. As for the abdominal wall defect closing method, Bradnock’s research, conducted in 2011, revealed mean hospitalization durations of 34 days for patients in whom the abdominal wall defect was closed primarily and of 38 days for patients treated by the silo method (285). In our research, the difference was not significant either in what concerned the hospitalization duration (p=0.758) or as far as survival rates were concerned (p=0.279). Nonetheless, the postoperative complication rate was higher in patients treated by the Schuster method; yet, this is also connected to the higher complexity of the cases included in this group (possible selection bias). Our research revealed a complication rate that was higher by at least 15% in the group of gastroschisis patients treated by the Schuster method than in the other patients (p=0.037).

After surgical abdominal wall closing, vermicular action is diminished for a few days to a few weeks. Enteral feeding will be delayed, as it will take 15 to 55 days to reach a sufficient oral food intake (322). The nasogastric intubation was maintained in all the gastroschisis patients and their exclusive parenteral feeding was not discontinued during the first few days after the surgery. Full enteral feeding was achieved in all the 34 surviving patients after 22.61±8.5 days on the average. The occurrence of compromised intestinal loops (p=0.013), intestinal atresia (p=0.027) and sepsis (p=0.012) were significant influence factors, as they delayed the onset of full enteral feeding of babies with gastroschisis. In a recent study, the mean parenteral feeding duration in simple gastroschisis was 23 days and extended to up to 51 days on the average in complex gastroschisis patients (285).

Surviving omphalocele and gastroschisis infants make up a significant share of the patients who are hospitalized for long periods of time in neonatal intensive care units. Infectious complications are the cause of the prolonged hospitalization, and morbidity and mortality rates of these patients. The very high mortality rate was
also due to the infections favored by the infants’ transportation by ambulance, sometimes on long distances and in inadequate conditions, which delayed their hospitalization in our hospital (10.33 hours for omphalocele and 4.98 hours for gastroschisis) and hence the performance of the surgical procedure. A recent study has proven the importance of early abdominal wall closing for decreasing the infectious complication rate: 21.2% infection rate in patients in whom the closing was delayed versus 8.2% in those in whom the abdominal wall was closed during the first 6 hours of life (287). Although all our patients were administered a mixture of at least two broad-spectrum antibiotics from the very beginning of their hospitalization, 61.4% of the gastroschisis patients and 37.1% of the omphalocele patients suffered from severe sepsis caused by hospital germs.

The influence of factors such as prematurity, case complexity, delivery method or type of surgical treatment on the prognosis and course of infants with gastroschisis has been frequently analyzed in literature (81, 216, 313). In our study, we tried to detect the influence of particular personal factors, of the surgical approach preferred or of the occurrence of sepsis on the postoperative evolution of gastroschisis patients, and we achieved the following results: the postoperative course of babies extracted by Cesarean section, with normal birth weight, in whom full viscera integration and per primam abdominal wall closing was achieved, and who did not develop post-operator sepsis, was significantly better, as they had lower death or further surgery rates. The use of a regression model designed to detect the factors with a significant influence on the patients’ postoperative course enabled us to achieve the following results: low birth weight increases the risk of postoperative complications by 17.4 times; sepsis increases the same risk of postoperative complications by 12.2 times, whereas the occurrence of compromised intestinal loops (complex gastroschisis) increases this risk by 5.5 times.

In omphalocele, if one conducts a comparative analysis of the groups of surviving patients depending on the time spent in hospital, one finds that the patients who underwent surgery spent a
considerably shorter time in hospital than the patients in whom a conservative approach was preferred, i.e. 14.20 days versus 37.63 days on the first hospitalization (p=0.001), and 17 days versus 53.05 days overall (p=0.0002). The overall survival rate in the group of 105 patients with omphalocele was 45.7% (50% in the patients having undergone surgery and 40.4% in those who were administered conservative therapy, despite the higher medical complication rate in the group of surgical patients). Moreover, most conservatively treated patients will require additional ventral hernia surveillance, follow-up and at least one additional surgical procedure to tackle their abdominal ventral muscle dehiscence, and esthetic and functional recovery. In a study conducted in 1997 on 31 omphalocele patients having undergone surgical treatment, Dunn reported a 10% mortality rate and a 52-day hospitalization time on the average, depending on the severity of the associated congenital abnormalities and on the extent of the visceral-abdominal disproportion (301). In a paper dating back to 2006 Lee pleads for conservative treatment only in patients with giant omphalocele and serious chromosomal, pulmonary or cardiac aberrations, and for remaining ventral hernia repairing at the age of 6-12 months (233). The authors report a mean hospitalization time of 20 days (5-239 days) as compared to 30 days (7-112 days) in our study, and a mean age on full enteral feeding onset of 8 days (4-80 days), as compared to 7 days (3-23 days), and a 13.3% mortality rate, as compared to our 59.6%.

Giant omphalocele is a condition that is difficult to treat, as its conservative treatment is often accompanied by severe complications such as sepsis, ruptured membranes and evisceration, injured intestinal loops or liver, bleeding. The extended hospitalization of these patients may also be a problem, and many of these children will die before the full epithelialization of their omphalocele (235). The surgical treatment of giant omphalocele faces the problem of visceral-abdominal disproportion. The last two decades have witnessed the routine use of spring loaded silo bags, which seems to be the favorite therapeutic approach in extended omphalocele (266). Given their high price, our hospital cannot afford
high performance silo-bag devices, so we have to resort to other types of prosthetic materials, with doubtful results, when applying the Schuster Method. Conservatively treated giant omphalocele runs risks of omphalocele membrane infection with multiresistant hospital germs, which are all the more severe when causing membrane necrosis and rupture. The local infection risk is even higher when using prosthetic materials, especially when wall closing is done under strain, as plate dislocation or surgical wound dehiscence may subsequently occur. All these results support the surgical treatment of omphalocele, unless this approach is contraindicated by the occurrence of severe chromosomal abnormalities, pulmonary hypoplasia or cardiac malformations that do not allow general anesthesia. Postnatal mortality is also closely connected to the occurrence of these conditions.

The long-term prognosis of infants with omphalocele depends on the occurrence and severity of chromosomal aberrations and associated congenital malformations, the occurrence rate of which may be as high as 72% (68), 71.4% in our study. The high mortality rate in our study is also due to the association of other severe congenital malformations (statistically significant difference between deceased and surviving patients), as well as to the absence of antenatal diagnosis. We note a significant association (p=0.030) between the antenatal diagnosis rate and the urban environment, since the inadequate social conditions in the rural environment are the cause of the low medical examination rate and hence the low condition diagnosis rate. When analyzing the age on hospitalization of the antenatal diagnosis patients, we note a significant difference of about 6 hours (p=0.023) in favor of the latter as compared to prenatal diagnosis patients. When anterior abdominal wall defect infants are not diagnosed prenatally and they are born in a hospital lacking adequate treatment facilities, the medical team should observe a postnatal infant transfer protocol as the one described by Stringer in 1991 (231). Unfortunately, this protocol was not always complied with, and 30% of the deceased omphalocele patients and 44% of the deceased gastroschisis patients were transferred to our
hospital in improper conditions, which had a negative influence on their survival rate.

If no severe cardiac or pulmonary malformations and chromosomal aberrations occur, most of these children will lead a normal life (304). A study conducted in 2001 concludes that the abnormalities and malformations associated to anterior abdominal wall defects are the main factors that may impair upon life quality on the long term (199). In 1997, Davies conducted a study on 23 surviving gastroschisis patients, the mean age of whom was 16 years, which revealed that 96% of them **had normal height and weight** and were in very good health. 35% of the subjects required further surgery, including for intestinal occlusion or postoperative scar follow-up. 57% of the children claimed to be inconvenienced (during their school activities, while in primary school) by the **appearance** and by the absence of an umbilical scar, but their importance diminished in time in 65% of the interviewed adolescents (305). **Remote results** on the postoperative course of anterior abdominal wall defects will consider both neonatal survival rates and subsequent sequelae, among which the abdominal wall appearance and the absence of scars play an important role and may impede upon the child’s later mental development. In all the omphalocele patients who underwent primary viscera integration in the peritoneal cavity included in our study, the achievement of a satisfactory appearance was attempted through umbilical plasty. Only 73.5% of the surviving gastroschisis infants came for follow-up at least once, 76% of whom had a positive course. The others experienced recurrent episodes of digestive intolerance and occlusions due to agglutination and ileal bundles, and thus suffered mild neuro-psycho-motor acquisition deficiencies and moderate failure to thrive. Only 64.5% of the surviving omphalocele infants came for follow-up at least once, 90.3% of whom had a positive course. The parents should be warned about the importance of the long-term follow-up of the patient, and also assured of the positive prognosis as concerns the growth and development of most of the children facing these problems.
CHAPTER 19. CONCLUSIONS

Although most of the demographic data of the patients included in our research are somewhat in agreement with the data in literature and the therapeutic approaches used in our hospital is in line with the current international trends, the morbidity and mortality rates of anterior abdominal wall defects are still very high in North-Eastern Romania. The early detection of associated congenital malformations by higher antenatal diagnosis rates of patients suffering from anterior abdominal wall defects (this rate was merely 12.3% in the group we analyzed), and especially from syndromic omphalocele, should become one of the main goals of maternal-fetal medicine. Both pediatric surgeons and obstetricians are responsible for the careful monitoring of pregnancies with antenatal gastroschisis diagnosis and for the scheduling of a premature delivery (35-36 weeks of gestational age), by Cesarean section, for a subsequent improved prognosis.

When the parents are faced with an antenatal diagnosis of congenital malformation, a multidisciplinary team should provide adequate support, in what concerns both the course and the prognosis of the fetus, as well as psychological effects on parents. This counseling should be done honestly, compassionately and uprightly, observing ethical principles such as autonomy, freedom of reproduction, benefaction and justice. The amazing medical developments and the use of state-of-the-art resuscitation and intensive care techniques makes it possible for infants with severe congenital malformations and chromosomal aberrations to survive. Nevertheless, the use of these techniques raises questions about the actual service done to the infant, considering the sometimes poor quality of life that these children have.

Given the high risk of association between anterior abdominal wall defects and chromosomal aberrations (27.6% in omphalocele) or other congenital malformations, the positive and differential antenatal diagnoses are crucial for fetus prognosis and family counseling. Awareness raising during the antenatal period on the bringing into this world of an omphalocele or gastroschisis baby,
both in parents and in the obstetrician and neonatologist, will result in greater care at the time of birth (all 7 patients with ruptured membrane omphalocele died) and in the patient’s efficient and rapid transfer towards a specialized pediatric surgery hospital and hence to higher survival rates (our study revealed a positive correlation between antenatal diagnosis and younger age on hospitalization, and between antenatal diagnosis and higher survival rates, respectively). In our country, higher antenatal diagnosis rates of severe associated chromosomal aberrations or congenital malformations (especially in omphalocele) may result into a therapeutic abortion decision meant to protect the families involved against the unwanted psychological effects of giving birth to a baby suffering from multiple malformations, which would put a considerable financial burden on pediatric surgery wards for the somewhat hopeless treatment of these babies. This would remove these patients with guarded prognosis from future studies and thus improve survival rates.

As concerns the postnatal management of patients with congenital anterior abdominal wall defects, I would suggest a more surgically aggressive approach to omphalocele (possibly by the use of the Schuster method), which would increase the mean number of days spent in hospital by patients having undergone surgery (relatively low in our study) but it would also increase the survival rates. On the other hand, the complex gastroschisis approach preferred in our clinic was too aggressive, as most specialized studies recommend leaving the atresia and stenosis areas as they are and only dealing with them at a later time, when the patient is medically stable, the intestine loops have regained their suppleness and the patient may tolerate the surgical procedure better. This would increase the chances of primary anastomosis and prevent stoma-related complications. A much feared complication of aggressive surgical procedures is the short intestine syndrome, the prognosis of which is guarded even in developed countries. Another problem that we noted in our research is the fact that a quarter of the complex gastroschisis patients suffered from a short intestine syndrome after the surgical procedures, and only one of these six patients survived,
since intestines are not transplanted in Romania. I also suggest that Molik’s classification be changed to include gastroschisis with liver herniation among the complex gastroschisis cases, due to the undeniable visceral-abdominal disproportion, to the difficult integration of the protruding organs, sometimes to the associated extra-abdominal abnormalities. Since the hospital lacked proper equipment to measure the intra-abdominal pressure and adequate prosthetic material, the anterior abdominal wall was closed per primam under strain in 10 patients included in the study, nine of whom died due to the abdominal compartment syndrome. Perhaps these patients might have been saved if they had been treated by progressive integrations and/or by the application of an umbilical cord patch. Prolonged sepsis and multiple organ failure, probably favored by the low antenatal diagnosis rate which in turn leads to delays in the patient’s transfer to a specialized hospital where he/she could get adequate surgical treatment and then proper monitoring in a neonatal intensive care unit, proved to be another main cause of mortality in the group under survey. Many of the in-hospital infections may be prevented if the perioperative asepsis and antisepsis rules are strictly observed and if systematic antibiotic therapy is administered, accompanied by antifungal protection when antibiotics are administered for a long time. The survival rate of the gastroschisis patients treated in our hospital after 2000 was 34.4% (ten percent more than a decade before), which is nonetheless a comforting result. On the other hand, the survival rate of omphalocele patients remained constant, i.e. 45.7% throughout the 23 years covered by our study. An interesting result of our study was the detection of the factors with a significant influence on the gastroschisis patients’ postoperative course: low birth weight increases the risk of postoperative complications by 17.4 times; sepsis increases the same risk of postoperative complications by 12.2 times, whereas the occurrence of compromised intestinal loops (complex gastroschisis) increases this risk by 5.5 times. Also, the postoperative course of babies with antenatal diagnosis, extracted by Cesarean section, and in whom full viscera integration and per primam abdominal wall closing was achieved, was significantly
better, as they had lower death or further surgery rates. If no abnormalities and malformations are associated, over 90% of the babies with anterior abdominal wall defects will enjoy normal physical, mental and intellectual development, and will be perfectly integrated in society as adults.

Considering all the above, many specialized studies are still needed to clarify congenital malformations in general and their diagnosis and treatment in particular, the causes of the extremely high morbidity and mortality rates in our country, as these malformations are an important neonatal mortality factor, classification in which we unfortunately rank very high in Europe.

19.1. ORIGINALITY AND NEW PERSPECTIVES BROUGHT ABOUT BY THIS PHD THESIS

Almost all the data included in the general part of the thesis were gathered from international literature, since there are very few original Romanian papers on congenital anterior abdominal wall defects, and even fewer conducted in Iasi and concerning the entire Moldova area. Our research, which is currently the most extended research on omphalocele and gastroschisis in the whole country, produces real data on the local incidence, risk and prognosis factors, diagnosis methods, treatment, survival rates and subsequent course of our patients. We compared our results with those in literature and we even suggested some solutions to improve the disease outcome and to alter Molik’s classification.

This paper emphasized the importance of education and family planning, of antenatal diagnosis, of childbirth in specialized centers and under different types of anesthesia, of customized medical and surgical treatment, and also of the material resources available in “Sfânta Maria” Emergency Children’s Hospital of Iași. The research refers to a period of 23 years and includes a group of 219 infants with omphalocele and gastroschisis. Data structuring and statistical analysis have proven, by important statistical correlations, postoperative outcome dependence on family, educational, socio-
economic and medical factors. Provided the maintenance and ongoing improvement of the prospective patient data collection model is managed and provided an improved cooperation with general practitioners, obstetricians, neonatologists and pediatricians is achieved, I think it is advisable and even necessary to continue my research on congenital anterior abdominal wall defects, as well as on other congenital malformations, and to achieve the best possible dissemination of information and results, with a view to improving our patients’ survival rates.

SELECTIVE REFERENCES:


