

Abstract

Prediction of intestinal damage in neonates with gastroschisis

MUDr. Frýbová Barbora

Objective: The aim of the study was to identify both prenatal ultrasonographic markers in fetuses and a biochemical marker in newborns with gastroschisis that predict postnatal outcome; to perform a new technique of defect closure by preformed silicone silo for gastroschisis and to evaluate long-term quality of life and somatic growth of patients with gastroschisis and compare them with the general population.

Material and Methods: The analysis of 122 patients with gastroschisis operated on between 2004-2018 at the Department of Paediatric Surgery of University Hospital Motol in Prague was performed. In the retrospective-prospective study (97 patients) ultrasound findings at the 30th week of pregnancy and medical reports were statistically analyzed to identify independent prenatal ultrasonographic predictors of postnatal outcome. In the prospective study, new surgical technique of preformed silicone silo for gastroschisis to perform the stepwise defect reconstruction was used in four patients. In the prospective I-FABP study (53 patients), the urine was collected during the first 48 hours after surgery from neonates operated on for GS. Neonates with surgery that did not include gut mucosa served as controls for simple GS and neonates with surgery for intestinal atresia served as control for complex GS patients. The I-FABP levels were analyzed by ELISA. A questionnaire survey of the quality of life of our patients treated between 2004–2012 was sent to 56 former patients with gastroschisis.

Results: In the retrospective-prospective study completed prenatal data were gathered from 97 pregnancies. Prenatal intra-abdominal bowel dilatation (cut-off 10 mm) correlated with the presence of atresia ($P < 0.01$), longer administration of parenteral nutrition, extended hospital stay (median 54 vs. 22 days; 67 vs. 36 days, both $P < 0.05$), and greater number of additional surgical procedures ($p < 0.05$). Infants with antenatal presence of thickened bowel wall (greater than or equal to 3 mm) required longer administration of parenteral nutrition (median 35 vs. 21 days; $P < 0.01$) and prolonged stay (median 47 vs. 38 days; $P < 0.05$). Presence of oligohydramnion (amniotic fluid index below 8 cm) was connected with longer administration of parenteral nutrition in newborns (median 30 vs. 15 days; $P < 0.05$). In the prospective study introducing new surgical technique, preformed silicone silo for gastroschisis was used to perform the stepwise defect reconstruction. Its functionality has been verified in four patients, none of them had compartment syndrome, all of them had a favorable postoperative course. In the prospective study of urinary I-FABP, I-FABP after the surgery was significantly higher in GS newborns than in control group; I-FABP in complex GS was higher than in simple GS. I-FABP can predict subsequent operation for ileus in patients with complex GS. Both ways of abdominal wall closure (i.e. primary closure and stepwise reconstruction: preformed silicone silo or goretex silo) led to similar levels of I-FABP. None of the static I-FABP values was useful for the outcome prediction. The steep decrease in I-FABP after the surgery is associated with faster recovery, but it cannot predict early start of minimal enteral feeding, full enteral feeding or length of hospitalization. 38 mothers of patients (68%) responded to the questionnaire. 33 of 38 mothers claimed that the quality of life of their child was very good, 4 of them responded that it was good. 1 mother confessed that the quality of life was very poor. Anthropometric data show comparable results with the standard population except for patients of 1 year of age who still have lower weight ($P < 0.001$) and body height in the 5th percentile and patients of 3 years of age who are also significantly thinner. 13% of patients in our study group have gastrointestinal problems. 9

patients (24%) attend follow-up at the neurological center (Attention Deficit Hyperactivity Disorder n=6, mental retardation n=1, dysarthria n=2), however, overall intellectual abilities are within normal range. 7 patients underwent surgery for umbilical (n=3) or inguinal hernia (n=4), 2 patients were operated on for undescended testicles, 3 patients were operated on for an adhesive ileus. 92% of mothers are very satisfied with the cosmetic result of the scar.

Conclusion: The isolated presence of oligohydramnion with amniotic fluid index below 8 cm, thickened bowel wall equal to or more than 3 mm and the prenatal intra- abdominal dilatation with 10 mm cut-off had significant predictive value for the adverse postnatal outcome of patients with gastroschisis. The use of preformed silicone silo for gastroschisis is safe and benefits the patients. To conclude the prospective I-FABP study, urinary I-FABP reflects the mucosal damage in gastroschisis but it has only a limited predictive value for patients' outcome. The questionnaire study has shown that the majority of patients after operation of gastroschisis have a very good quality of life without limitation in comparison with the general population. The presented anthropometric data confirm that the development of patients with gastroschisis is favourable.

Keywords: simple gastroschisis, complex gastroschisis, urinary I-FABP, prenatal ultrasound, quality of life