CASE REPORT

Minimally Invasive Supraumbilical Approach for Pyloromyotomy

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Background: The three major approaches for Ramstedt pyloromyotomy – right upper quadrant incision, supraumbilical incision and laparoscopic method, are often compared, with some preference given to the supraumbilical approach. It becomes widely adopted in many centers around the world.

Aim: To analyse the early results of the supraumbilical incision in treatment of hypertrophic pyloric stenosis and to test a hypothesis that this technique may be valuable in our clinical conditions.

Materials and methods: Within a ten-month period five children with hypertrophic pyloric stenosis were selected (using single random sample) for pyloromyotomy via supraumbilical incision and another five children - via Robertson incision. This technique consists of semi lunar cutting in the upper half of umbilicus, extended cranially in the midline. After a Ramstedt pyloromyotomy, linea alba is sutured and the reshaped skin is sutured in semilunar manner around the umbilicus. The scar was estimated with Patient and Observer Scar Assessment Scale.

Results: The operations were performed by pediatric surgeons with different experience and with basic equipment. The operative time was 5-10 min longer for the supraumbilical incision. The pyloromyotomy led to a definitive healing, with timely feeding and discharging, without any complication. The quality of the scar was significantly better after the supraumbilical incision.

Conclusion: Supraumbilical incision is reliable and related to low complication rates. It leaves better scar than the Robertson incision and is an excellent alternative in search for less invasive techniques.

BACKGROUND

Hypertrophic pyloric stenosis (HPS) is a frequent condition in newborns and its surgical treatment includes the Ramstedt pyloromyotomy in the vast majority of cases.1-25 The access to the abdominal cavity, nevertheless, is still an issue of debate reflecting on the best functional and cosmetic outcome. The classical right upper quadrant incision (Robertson) is giving way to minimally invasive surgical procedures like the laparoscopic method and the supraumbilical incision (SUI). The latter is described by Tan and Bianchi22 in 1986, achieving excellent results in 40 cases and subsequently modified and improved by different authors.1,3,13,16,25 In the next decades it became, along with its variations, the most frequently used approach in many centers around the world – in UK, USA, Canada, Finland, Austria, Ireland, South Korea, Morocco, Saudi Arabia, Mali etc. and certain authors apply it also in operating other anomalies - malrotation, duodenal atresia, and intestinal atresia.7,8,10-13,18,20,24,25 There are several recent studies comparing the three surgical modalities in terms of feasibility, complication rate and scar quality. Despite presenting controversial results, they show that the laparoscopic and supraumbilical approaches are slightly superior to the Robertson approach. The SUI seemed to be safer and even more efficient than the laparoscopic method, with lower complication rate, shorter hospital stay and an almost invisible scar left.4,7,8,12,14,22,24 It is also easier to be performed in less technologically-advanced centres and by surgeons with less experience with this technique and by resident stuff, in contrast with the experience needed for a safe laparoscopic pyloromyotomy.10,24 In pediatric surgery centres in Bulgaria pyloromyotomy is performed via Robertson incision or laparoscopically and SUI has never been used until this case series.

AIM

The objective of the article was to analyze the feasibility and the early results of introducing SUI in
the treatment of hypertrophic pyloric stenosis and comparing it with the standard Robertson incision, in order to put forward a hypothesis whether this technique may be valuable in our clinical conditions.

MATERIALS AND METHODS

The inclusion criteria for the cases were clinical, ultrasound-proved (muscle thickness > 4mm and typical view) diagnosis HPS and parent’s informed consent. The exclusion criteria are failing to obtain parent’s consent for surgery or for study. From all children presented with HPS, 50% were selected for the new technique, using simple random sample. The selection was up to the surgeon and was not conditioned either by the patient’s status or by the pyloric ultrasound diameters. Before every child operated via SUI, one was operated via Robertson incision, thus the ten patients for a ten-month period in 2017 were randomly split in two even parts.

SUI needs clearing of the umbilicus with antiseptic solution for 24 hours. Perioperative or postoperative antibiotic prophylaxis of wound infection is not routinely used. After routine cleaning, SUI begins with semi lunar cutting of the skin in the upper half of umbilical circumference. This incision is extended cranially in the midline for about 2 cm (half its semi lunar length). Afterwards linea alba is incised vertically, little further than the skin and with dosed traction the wound is expanded enough for the pylorus to be detected and delivered into the operative field. A classic Ramstedt pyloromyotomy is performed and the passage of fluid demonstrated. The abdominal cavity is closed. Linea alba is sutured with interrupted sutures. After excising the angles, the skin is sutured with intracuticular sutures, in semi lunar manner around the umbilicus. In the postoperative period we apply the standard regimen and feedings with more attention paid to the wound. Once children start to gradually gain weight, they are discharged. The body-weight and the quality of scar are estimated 6-9 months after the surgery by the two parents and the surgeon who have performed it. After body-weight is measured, it is compared to the pediatric chart ‘age-normal weight’. We use Patient and Observer Scar Assessment Scale (POSAS) modified for toddlers, according to which, the parents evaluate four different qualities of the scar in scale from 1 to 10 (from best to worse) (Figs 1, 2).
RESULTS

Five children with hypertrophic pyloric stenosis were operated in 2017 using SUI – one girl and four boys, and another five were operated via Robertson incision. The surgeries were performed by three pediatric surgeons with different experience (2, 9 and 30 years practicing, respectively) and with basic surgical equipment. The operative time in SUI group was about 30-40 min (mean 38 min) or 5-10 minutes longer than the operations with Robertson incision. The longer time was for locating and delivering the pylorus into the wound. The pyloromyotomy led to a definitive healing in all ten children, with timely first feeding (6-8 hours after pyloromyotomy), full-feeding time (4-5 days) and discharging (6-7 days), without any postoperative complication.

None of the patients was lost to follow-up and all ten children were developing completely well, having body-weight normal for their respective age. The cosmetic appearance of the scars of both groups was evaluated after 6-9 months with POSAS and the average scores for the five children of the SUI group were – 1.25; 1.75; 2.5; 2.5; 3, respectively (1 being ‘best’ and 10 - ‘worst’). The overall satisfaction of the scar was – 1; 2; 2; 2; 3 (mean 2), respectively (1 being ‘best’ and 10 - ‘worst’). The results of the Robertson group were 2.5; 3; 3; 3.5; 4.5 and the overall satisfaction – 2; 2; 3; 4 (mean 3.3), respectively.

DISCUSSION

Like all case series reports, this study has the disadvantage of selection bias, but it is highly minimized. The children who received SUI instead of Robertson incision were chosen applying simple random sample - every second child with HPS was selected for SUI. Reporting bias is avoided, as none patient was lost to follow-up - nor was any left unreported. Observation bias is also diminished using objective measures like first feeding and full feeding times, discharging time and body-weight. Rating the scar nonetheless might be influenced by the parents’ subjectivity, even with the standardized scale (POSAS).

Supraumbilical approach for pyloromyotomy is reported to be accessible to perform with less need of equipment and by less experienced pediatric surgeons or residents, which our experience confirms. One of the SUI pyloromyotomies was performed by a resident in Pediatric Surgery with two years of experience and other two by a pediatric surgeon with eight years of experience. Accordingly, Robertson incision was also performed by the same surgeons. Both approaches do not require any special equipment, so they are widely feasible and cheap in contrast with the laparoscopic method. SUI needs slightly more operating time (5 to 10 min) than the standard Robertson incision, which is related to the experience required for attaining proficiency in the technique. Delivering the pylorus into the operative wound is the most difficult, traumatic and time-consuming stage of the operation and should be performed carefully. In both SUI and Robertson group the feeding regimen (first feeding time and full feeding time) was the standard for pyloromyotomy one and the discharge was within the accepted period – 6-7 days.

In terms of reliability, the SUI shows encouraging results. One SUI and two Robertson children had a vomiting at postoperative days 3 and 4, which led to little reduction (10 ml) in the given formula for a day and subsequently the discharge was one day later than other children. In the literature and in our unit it is considered a self-limited condition, result of longer period of preoperative vomiting and distended stomach. Self-limited postoperative vomiting is reported in up to 27% of cases and is considered not to be related to the operation technique. All our children did not have any complication, which can be compared to the initial series of other authors. Perforation of the mucosa is reported in up to 6.9%, recurrent pyloric stenosis requiring re operation in 0-6%, and wound infections in 2% of laparoscopically performed pyloromyotomies. In children approached with Robertson incision these rates are 1.4%; 0.3% and 2.5%, respectively. Besson reports converting to Robertson incision due to inadequacy of the performed SUI in 3.1%. All five children in our study were operated via SUI without the need of additional incision.

As regards the cosmetics, other authors describe the scars after SUI as better than the scars of Robertson incision and even than these from the...
laparoscopic approach, to which our results are supportive enough.\textsuperscript{4,8,23} Six to nine months after the operation the parents’ overall satisfaction was excellent and the results from POSAS for SUI were near to the best possible. These for Robertson incision were significantly worse (mean score: SUI - 2; Robertson - 3.3). The SUI scars were soft, short, thin, leveled with the skin and virtually inside the umbilical circumference, which could be contrasted with the more visible and longer Robertson scar, and should be considered a principal advantage of this approach (Fig 3).

CONCLUSION

Umbilical access for pyloromyotomy has never been used before in Bulgaria, but because of its advantages it is worth some research. Although SUI needs little more operative time initially, it is reliable and related to low complication rates. This incision leaves better scar than the classic and even the laparoscopic approach and it is markedly more feasible than the laparoscopic pyloromyotomy. In search for less invasive techniques and better cosmetic outcome SUI is an excellent alternative to the Robertson incision and the laparoscopic method. Therefore, we have come to the conclusion that SUI is a reliable technique which may be valuable in our practice. We acknowledge the need for this early hypothesis to be subsequently tested in a randomized controlled trial.

REFERENCES


\begin{figure}[h]
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\includegraphics[width=\textwidth]{scar_comparision.jpg}
\caption{Comparison of the scars. Left – supraumbilical / Right – Robertson.}
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Minimally Invasive Supraumbilical Approach for Pyloromyotomy

Минимально инвазивный супра-умбиликальный подход при пилоромиотомии

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Введение: Три основных подхода к пилоромиотомии по Рамштедту - инцизия в верхнем правом квадранте, супра-умбиликальный разрез и лапароскопические методы часто сравнивают, отдавая предпочтение супра-умбиликальному подходу. Он стал широко применяться во многих центрах по всему миру.

Цель: Проанализировать ранние результаты супра-умбиликального разреза при лечении гипертрофического стеноза привратника и исследовать гипотезу, что этот уникальный метод может быть полезным для наших клинических состояний.

Материалы и методы: В течение десяти месяцев, было отобрано десять детей с гипертрофическим пилорическим стенозом (методом единичной случайной выборки) для проведения пилоромиотомии с применением супра-умбиликального разреза и пять детей с применением разреза Робертсона. Суть этого метода заключается в разрезе в форме полумесяца в верхней половине пуповины, который расширяется краниально по срединной линии. После пилоромиотомии по Рамштедту, белая линия живота ушивается, а реструктурированная кожа ушивается в форме полумесяца вокруг пупка. Рубец оценивали по Шкале оценки состояния рубцов наблюдателем и пациентом (Patient and Observer Scar Assessment Scale).

Результаты: Операции проводились детскими хирургами, имеющими разный профессиональный опыт и располагающими разным основным оборудованием. Время проведения операции с применением супра-умбиликального разреза было на 5 – 10 мин. дольше. Пилоромиотомия привела к окончательному выздоровлению со своевременным приёмом пищи и выпиской без каких-либо осложнений. Качество рубца было значительно лучше при супра-умбиликальном разрезе.

Выводы: Супра-умбиликальный разрез является надёжным и связан с более низкой частотой осложнений. Он оставляет менее заметный рубец по сравнению с разрезом Робертсона и является отличной альтернативой в поисках менее инвазивных методов.