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Functional outcomes of early versus delayed pyeloplasty in prenatally diagnosed pelvi-ureteric junction obstruction

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Summary
Although initial conservative management is popular in the management of antenatally detected pelvi ureteric junction (PUJ) obstruction [1–3], several authors [4,5] have questioned this approach and expressed concern about failure to recover the function lost during expectant management following surgery. In this single center prospective study, we have compared the functional outcomes following early versus delayed pyeloplasty in SFU grade 3–4 PUJ obstruction.

Methods
Among those children, who presented between 2004 and 2013, with prenatal diagnoses of unilateral PUJ obstruction (n = 886), those with SFU grade 1 or 2 hydronephrosis on USG (n = 533) were excluded. In the remaining 353 children with SFU grade 3 and 4 hydronephrosis, 243 had obstructive pattern on radionuclide scan. After excluding those with severely impaired or supranormal split renal function (SRF), palpable mass, single kidney status, bilateral disease and associated other urological anomalies a total of 126 children were included in the study group.

Parents who were unwilling for a frequent follow-up underwent early pyeloplasty, (Group I: n = 62) while the remaining underwent initial conservative management, with 3 monthly USG and nuclear scans (Group II; n = 64). In this group pyeloplasty was performed whenever there was deterioration in SRF >10%, or urine infection or pain during the follow-up.

A standard open dismembered pyeloplasty was performed by the same surgeon in all patients. Radionuclide scan was performed at 1 year, at the same center using the same protocol, to assess final SRF and drainage. The functional outcomes were compared using student's t test and chi square test.

Results
Group I comprised of 62 patients while Group II 64 patients. The mean age at pyeloplasty was 2.8 months in group I while 12.5 months in group II. There was no significant difference in the initial antero posterior diameter (APD) between the groups; 30.2 (±3.2) mm in group I and 29.6 (±3.7) mm in group II. At 1-year follow up after surgery, there was improvement in the APD, 16.8 (±4.2) mm in group I and 18.2 (±4.5) mm in group II, with no significant difference between them.

In group I, the initial mean SRF was 34.1% (±6.4) and there was significant improvement ($p = 0.01$) in mean SRF to 37.2 (±7.1) at 1-year follow up after surgery. In group II, the mean SRF was 35.9 (5.7) initially and there was a deterioration to 32.6 (±5.5) before surgery (Figure). At 1-year follow up after surgery, there was a marginal improvement to 33.5 (5.6), however it was significantly lower compared to the initial SRF ($p = 0.01$).

Compared to initial function, at 1-year follow up after pyeloplasty, SRF improved in significantly higher number of patients; 17/62 (27.4%) in group I while only 7/64 (10.9%) in group II ($p = 0.03$) (Table). There was significantly fewer patients with deterioration in final SRF at 8/62 (12.9%) in group I compared to 22/64 (34.4%) in group II ($p = 0.03$).

Discussion
Although several publications [1–3] have reported functional recovery during initial conservative treatment of PUJ obstruction, in our study a large proportion of patients (80%) in Group II had loss of function during follow-up. This is probably because the study population included only SFU grade 3–4 with obstructive renogram. Several authors have expressed concern about irreversible loss of renal function during expectant management [4,5].

Findings of our study reveal that irrespective of initial SRF, early pyeloplasty in prenatally diagnosed SFU grade 3–4 PUJ obstruction leads to significant improvement of SRF, while delayed pyeloplasty leads to a marginal but, significant loss. This fact should be highlighted to parents so that informed decisions can be made regarding early versus delayed surgery.

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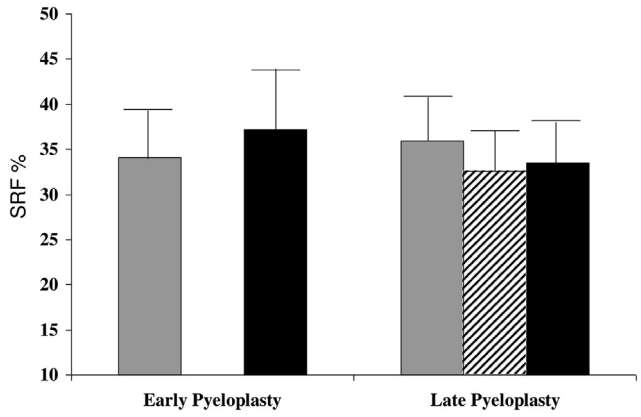

Figure

The main challenge in the management of antenatally detected pelvi-ureteric junction (PUJ) obstruction is to differentiate the ones that are likely to resolve from the ones that are pathological. With a better understanding of its natural history [1—3], an initial conservative approach has become the standard with surgery reserved for those kidneys with a significant loss of split renal function (SRF). But several authors have questioned this approach and expressed concern about failure to recover the function lost during expectant management following surgery [4,5].

Earlier studies that reported favorable outcome with expectant management often included lower Society of Fetal Urology (SFU) grades also thereby confounding the outcomes [6]. However further studies showed that early pyeloplasty could actually lead to improvement in SRF [7]. Studies have shown that subjects with PUJ obstruction with SFU grade 3—4 are at a higher risk of requiring surgery and must be followed up meticulously during management [8,9]. In this single-center prospective study, we have compared the functional outcomes following early versus delayed pyeloplasty in SFU grade 3—4 PUJ obstruction.

Methods

All children who presented between 2004 and 2013 with prenatal diagnoses of unilateral PUJ obstruction ($n = 886$) were prospectively analyzed. Ultrasonogram (USG) was used at the end of the first week of life to confirm the diagnosis and grade according to the SFU. Those with SFU grade 1 or 2 hydronephrosis on USG ($n = 533$) underwent initial conservative management and were excluded. In the remaining 353 children with SFU grades 3 and 4, radionuclide evaluation with ^{99m}Tc-MAG3 (frusemide after 15 min) and voiding cystourethrogram was performed at 4—6 weeks of life. A total of 110 did not have the obstructive pattern on the renogram, a type IIIa or IIIb O′ Reilly curve [10], or drainage at 2-h delayed film, and were excluded. Of the remaining 243 with the obstructive pattern on the radionuclide scan, type II O′ Reilly curve [10], and hold up at 2-h delayed films as shown in Fig. 1, those with severely impaired (<20%) SRF ($n = 24$) or supranormal (>50%) SRF ($n = 18$) on radionuclide scan, palpable mass ($n = 12$), single kidney status ($n = 10$), bilateral disease ($n = 26$), associated vesico-ureteric reflux ($n = 24$), and other urological anomalies ($n = 3$) were excluded, leaving a total of 126 children in the study group.

Parents were counseled regarding the severity of hydronephrosis and the obstructive pattern. Those who were concerned with loss of function or were unwilling for frequent repeated evaluation underwent early pyeloplasty as soon as recruited (Group I: $n = 62$). Those who were willing for strict follow-up protocol and understood the risk of deterioration during follow-up underwent initial conservative management, with 3 monthly USG and nuclear scans (Group II; $n = 64$). In this group pyeloplasty was performed whenever there was deterioration in SRF >10%, or urine infection or pain during the follow-up. Informed consent was obtained in all cases. The study was not blinded to surgeon or data analyst; however, the nuclear medicine physician was blinded to the patient groups. Although we attempted to allot consecutive/alternative patients to two groups, we did not get approval for randomization. Institutional ethical committee approval was obtained for a prospective non-randomized study design.

A standard open dismembered pyeloplasty was performed by the same surgeon in all patients via the extraperitoneal approach using 7-0 polyglactin interrupted and continuous sutures with an indwelling double J stent. The stent was removed after 6—8 weeks and follow-up USG was carried at 3-monthly intervals to ensure improvement. A Radionuclide scan was performed at 1 year, at the same center using the same protocol, to assess final SRF and drainage. Improvement in the drainage pattern was defined as improvement from type II to type IIIa or IIIb O′ Reilly curve pattern [10], reduction in $t_{1/2}$ and less/no hold-up at 2-h delayed films. Functional outcome was defined as "improved" when there was more than 10% increase in SRF from original value, "lost" when there was more than 10% decrease, and as "stable" when there was less than 10% difference from the original value. The outcomes were compared using the Student t test and chi-square test.

Results

Table 1 shows the characteristics and outcomes in the groups. Group I comprised 62 patients while Group II comprised of patients, including the one who switched over. The indications for pyeloplasty in Group II were deterioration in SRF ($n = 52$) or symptoms of urine infection/colicky pain ($n = 12$). The mean age at pyeloplasty was 2.8 months in Group I and 12.5 months in Group II. There was no significant difference in the initial APD between the groups: 30.2 (3.2) mm in Group I and 29.6 (3.7) mm in Group II. At the 1-year follow-up after surgery, there was improvement in the APD, 16.8 (4.2) mm in Group I and 18.2 (4.5) mm in Group II, with no significant difference between them. This was corroborated by improvement in the drainage pattern on nuclear renogram in all patients.

Fig. 2 compares the functional outcomes between groups. In Group I, the initial mean SRF was 34.1 (6.4) and there was significant improvement ($p = 0.01$) in mean SRF to 37.2 (7.1) at the 1-year follow-up after surgery. In Group II, the mean SRF was 35.9 (5.7) initially and there was a