ORIGINAL ARTICLE

Blunt Renal Trauma in Children: Our experience with Conservative Management at Children Hospital & ICH Multan

ASIF ABBAS KHAWAJA[1], MUHAMMAD ASLAM[2], SHAHNAB AHMAD[3]
[1]Associate Professor Pediatric urology, Department of Pediatric Urology, Children Hospital & Institute of Child Health, Multan.
[2,3]Associate Porfessor, Department of Pediatric Surgery , Children Hospital & Institute of Child Health, Multan.
Correspondence to Dr Asif Khawaja. E mail: dr_asif_kh@hotmail.com Cell: 0300 6335715.

ABSTRACT

Background: Pediatric kidney is believed to be more susceptible to trauma due to decrease in physical renal protective mechanism. Blunt renal trauma is common injury seen in children and accounts for more than 90% of renal injuries in pediatric population.
Method: All children with blunt renal trauma referred to us through emergency, outdoor or from other institutions were included in the study. Data of all patients was reviewed retrospectively. Injuries were graded according to the American Association for the Surgery of Trauma Organ Injury Scale. Outcome of all cases was reviewed.
Results: Twentytwo patients with Grade I to V were included in this study. Surgery was performed in two patients. One patient with Puj disruption was attempted cystoscopy and retrograde catherization but failed. Later he was operated and Puj reconstruction was done. Other patient had neglected Puj obstruction with nonfunctioning kidney, so nephrectomy was done. Eleven patient required blood transfusion.
Conclusion: These data support the use of conservative management for all grades in stable children with blunt renal injury.
Keywords: Renal trauma, conservative management, renal injury

INTRODUCTION

Blunt trauma abdomen is one of the commonest injuries encountered in emergency ward. Kidneys are susceptible to trauma due to decrease in physical protective mechanism as compared to adults. In a recent study by basaran[1] , blunt abdominal trauma is encountered in 92.8% cases and penetrating injury in 7.2% cases in children. Of all solid organs injury, kidneys are the third most common organ involved ie 17% .

Management of renal trauma depends upon the severity of the injury. Severity of injury is often unrecognized in emergency room. Nowadays more than 90% of injuries to solid organs in children can be managed conservatively. A recent study by Govindarajan also favor conservative management of high grade renal injuries in children[2]. However high grade injuries need constant follow up and monitoring as some patients may experience decline in renal function.[3]

Management protocols for adult blunt renal trauma are well defined but treatment protocols for children are not clear. We present here our experience of management of blunt renal trauma in children at Children hospital complex & Institute of child health, Multan,(CHC & ICH) which is a tertiary care unit. This experience will help develop protocols of management of pediatric blunt renal trauma in our setup.

METHODOLOGY

It is a descriptive study conducted in the department of Pediatric urology CHC & ICH, Multan. Records of all Patients from January 2011 to June 2017 with blunt renal trauma treated in our institution were reviewed retrospectively and included in the study.

Received on 13-07-2019
Accepted on 27-01-2020

Inclusion criteria: All children with blunt renal trauma off all grades were included in the study.
Exclusion criteria: age above 14 years, penetrating trauma and iatrogenic injuries were excluded from the study.
All patients were initially managed in emergency room. Important data like age, sex, mechanism of injury, mode of presentation and clinical findings were noted. Base line studies like Complete blood examination, Complete urine examination, urea, creatinine, serum slectrolytes were done in all patients and serially CBC and Hematocrit were repeated in patients with hemodynamic unstability or needing blood transfusions. Initial imaging study performed was Ultrasound Abdomen in all patients. CT scan, and DTPA renal scan were performed where indicated. Definite management, hospital stay were noted. Follow up findings were noted like clinical examination, laboratory tests, Ultrasound abdomen, if needed repeat CT scan and DTPA renal scan were also done.

RESULTS

During seven years of study we found the record of twentytwo patients. There were 12 males and 10 females included in the study during 5 years and 6 months. Age ranges from 3 years to 10 years. Mean age was 6.5 years.

Mode of injury was by road traffic accident in 9 patients, fall of wall 5 patients and hit by an object like corner of table 8 patients. Right kidney was involved in 8 patients and left kidney in 14 patients. Single or multiple episodes of gross hematuria was initial presentation in majority of patients which brought them to the emergency room. Generalized abdominal tenderness with episodes of vomiting was present in 15 patients. Abdominal bruises were seen in 9 patients. CBC showed Hemoglobin above 9.5 in 11 patients (50%), b/w 8.5-9.5 in 2 patients (9%), b/w 7-8.5mg/dl in 6 patients (27%) and below 7mg/dl in 3 patients (13.6%). Urea creatinine and electrolytes were mostly normal in all our patients. CUE showed field full

RBC in all 22 patients (100%). Ultrasound examination is the initial imaging performed in all patients but it showed variable results. It was able to pick renal injury in 20 patients but its accuracy in staging the injury was in 6 patients. It picked additional findings like liver injury, spleen injury, free abdominal fluid and mild pleural effusion in14 patients. CT scan was performed in 21 patients. It reported accurately stages of injury in all patients. In 2 patients, 1 with grade IV and 1 with grade V injury, CT scan was repeated during follow up due to persistent urinoma. It also picked associated injuries, 2 with splenic laceration, 1 with adrenal hematoma and 2 with Liver injuries.

Table 1: Ultrasound vs ct scan regarding diagnosis of renal injury

	ULTRA SOUND	CT SCAN
Accurate staging of injury	1, G I 3, G II 2, G III 0, G IV 0, G V	2, G 1 4, G II 6, G III 7, G IV 2 G V
Missed renal injury	1 G I, 1 G III	0
False staging of injury	1, G II, 4, G III,	0

Table 2 Treatment of patients according to grades of injury

Grade of injury	n	BT/ FFP	Treatment	Hospital stay
Grade I	3		All Conservative	1-2 days
Grade II	4		All Conservative	1-2 days
Grade III	6	2	1 nephrectomy for neglected PUJ, 5 conservative	3-7 days
Grade IV	7	7	1 PCN, cystoscopy Rt retrograde catheter, Rt puj reconstruction. 6 conservative	3 weeks 4-8 days
Grade V	2	2, 1	All conservative	7-9 days

Total number of associated injuries was 6 patients 27%. One patient had Splenic laceration and small left adrenal hematoma and other patient had splenic injury alone both were managed conservatively. Two patients with Liver injuries were also managed conservatively. One patient with RTA had fractured femur and was operated for it. In one patient with neglected Pelvi ureteric junction obstruction, nephrectomy was performed later.

DISCUSSION

Trauma is one of the leading cause of solid organ injury and children are at increased risk of blunt renal trauma due to several reasons.[4]. The physical protective mechanism of the abdomen is less developed in children as compared to adults[5] and incidence of undiagnosed congenital anomalies of kidneys are high which makes them vulnerable to blunt abdominal injuries.[6]

During the last decade there has generally been a trend toward non operative management of blunt abdominal trauma. With systematic approach, most cases of abdominal trauma can be treated with observation and medical treatment.[7]Immediately after trauma renal injuries are not recognized in most cases. Physical signs of trauma like bruises, scars are not usually visible in blunt abdominal trauma. Generalized abdominal tenderness may be present in some cases. Hematuria is initial sign of genitourinary tract injury which compell the parents to bring their child to emergency department and is present in nearly all our cases. Severity of hematuria does not correlate with the grade of renal trauma and may be only minor bleeding with stable patient in grade IV to V injuries.[8] Similarly most of the children despite the severity of injury are hemodynamically stable at presentation.[5]

Ultrasound (US) is the initial imaging study of choice and is routinely performed in all cases. It is readily available, cheap, free from ionizing radiation and can be repeated as frequently as needed. Several studies have been conducted about the utility of ultrasound as the first line study and protocols have been developed to improve its specificity and sensitivity. It must be noted that US is an operator dependent technique and same results are not reproducible each time. In our patients US was able to detect renal injury in 20(90%) patients but its accuracy in correct staging the injury was only in 6(27%) patients. This drawback of US limits our ability to devise correct management plan for the patient. On the other hand triphasic CT scan abdomen not only diagnose and correctly stage the injuries in all our cases but also tells us about associated injuries and other congenital anomalies.[9] This advantage of CT scan makes it the imaging study of choice in blunt abdominal trauma.

There is considerable controversay about follow up imaging studies in patients with blunt abdominal trauma. Some authors have fovoured routine repeat early or delayed ct scan abdomen for patients of grade 3 with devitalized segments and higher grade renal injuries. However due to risks of ionizing radiation to children ALARA concept is developed and repeat ct scan is recommended only in early phase in certain situtations like large expnding medial hematoma or urinoma, persistent gross hematuria with hemodynamic unstability.[10] Other wise for routine follow up ultra sound studies are sufficient to detect resolution of injuries.[11]

Mostly low grades of renal injuries are seen in blunt renal trauma cases worldwide.[12] Our series of cases also showed that 60% of case were of grades I, II and III. There is generally a consensus that grades I, II and III could be manaed successively with medical management.[13]

Previously grade 4 and 5 and some patients with grade 3 were routinely managed with surgical intervention. However there is a trend towards conservative management of high grade injuries to solid organ world wide.[14] This has only be possible due to correct staging of injury. Most soild organs liver, spleen and kidneys are routinely managed in adults in nonoperative manner.[15] Several studies fovour similar conservative management in children and reported good results.[16] Risks associated with operating on hemodynamic unstable patients without complete staging the injury and no knowledge about the functionality of the contralateral kidney are very high. Several centres have reported that with conservative management even grade 4 and 5 renal injuries can be managed nonoperatively.[17] Tri phasic ct scan must be performed before selecting the nonoperaative management to rule out renal pedicle or selective renal vessel injuy as it cause persistent life threatening bleeding.[18] Now a days with with development and expertise in interventional radiology selective thrombo embolization can also successively control bleeding and can prevent open surgery in many patients.[19]

Second main finding to rule out is injury to renal pelvis or pelvi-ureteral junction disruption. This may lead to large medial or lateral urinoma of considerable size with nonvisualization of ureter on CT scan. The chances of spontaneous healing or with stenting or pcn are very little.[20] In this scenario early intervention and reconstruction of injured area not only saves the kidney but also improves the healing with minimal morbidity.[21] This happened in one of our case. Although if the patency of ureter is confirmed on ct scan then even large urinomas can also be managed by minimal invasive interventions like double j stent or percutaneous nephrostomy insertion.[22]

Some times congenital urinaty tract anomalies are diagnosed for the very first time after trauma and the functionality of the kidney is also not known. It is better to put nephrostomy in such kidneys and after four to six weeks functional study should be performed and surgery decided accordingly. Direct surgical intervention without giving this kidney the chance of improvement usually results in nephrectomy. So with conservative management lot of kidneys can be saved.

Long term studies following blunt renal trauma have shown that the kidneys with higher grade of injury when managed conservatively are associated with certain complicatopns. Cyst formation at the injured site, shrinkage of the kidney with progressive loss of function and development of hypertension have all been reported in the literature. These findings suggest continuous followup in these patients. Our two patients with grade IV and V developed small cyst and three patients had progressive decrease in kidney function and no patients developed hypertension. None of these complication needed any surgical intervention. Our findings were consistent with international studies.

Conservative management does have a strong role in the management of blunt renal trauma in children but it requires close monitoring of patients and timely intervention.[23]

CONCLUSION

Children with blunt renal trauma of all grades can be managed safely in our setup. Before embarking on conservative protocol tri phasic ct scan must be performed in all cases where clinical suspicion of high grade injury is high, ultrasound suggests any higher grade of renal injury and any congenital abnormality of the urinary tract or associated organ injury are identified.

REFERENCES

1. Basaran A, Ozkan S. Evaluation of intra-abdominal solid organ injuries in children. Acta Biomed. 2019;89(4):505-12.
2. Govindarajan KK, Utagi M, Naredi BK, Jindal B, Sambandan K, Subramaniam D. High grade renal trauma due to blunt injury in children: do all require intervention? Jornal brasileiro de nefrologia : 'orgao oficial de Sociedades Brasileira e Latino-Americana de Nefrologia. 2019;
3. Wong KY, Jeeneea R, Healey A, Abernethy L, Corbett HJ, McAndrew HF et al. Management of paediatric high-grade blunt renal trauma: a 10-year single-centre UK experience. BJU Int. 2018;121(6):923-7.
4. Fernández-Ibieta M. Renal Trauma in Pediatrics: A Current Review. Urology. 2018;113:171-8.
5. Brouwers L, Bemelman M, Kramer WLM, van der Heijden FHWM. [Management of blunt renal trauma in paediatric patients]. Ned Tijdschr Geneeskd. 2016;160:D284.
6. Dahlstrom K, Dunoski B, Zerin JM. Blunt renal trauma in children with pre-existing renal abnormalities. Pediatr Radiol. 2015;45(1):118-23; quiz 115.
7. Notrica DM, Linnaus ME. Nonoperative Management of Blunt Solid Organ Injury in Pediatric Surgery. Surg Clin North Am. 2017;97(1):1-20.
8. Graziano KD, Juang D, Notrica D, Grandsoult VL, Acosta J, Sharp SW et al. Prospective observational study with an abbreviated protocol in the management of blunt renal injury in children. J Pediatr Surg. 2014;49(1):198-200
9. Bartley JM, Santucci RA. Computed tomography findings in patients with pediatric blunt renal trauma in whom expectant (nonoperative) management failed. Urology. 2012;80(6): 1338
10. Lee JN, Lim JK, Woo MJ, Kwon SY, Kim BS, Kim HT et al. Predictive factors for conservative treatment failure in grade IV pediatric blunt renal trauma. Journal of pediatric urology. 2016;12(2):93.e1-7.
11. Canon S, Recicar J, Head B, Linam L, Swearingen C, Maxson T. The utility of initial and follow-up ultrasound reevaluation for blunt renal trauma in children and adolescents. Journal of pediatric urology. 2014;10(5):815-8.
12. Dangle PP, Fuller TW, Gaines B, Cannon GM, Schneck FX, Stephany HA et al. Evolving Mechanisms of Injury and Management of Pediatric Blunt Renal Trauma--20 Years of Experience. Urology. 2016;90:159-63.
13. Balcıoğlu ME, Boleken ME, Çevik M, Savaş M, Boyacı FN. [Blunt renal trauma in children: a retrospective analysis of 41 cases]. Ulus Travma Acil Cerrahi Derg. 2014;20(2):132-5.
14. Takamatsu K, Nakajima Y, Ishida M, Ohara R, Kosugi M, Kitano M et al. Predictive factors of the initial treatment for 207 blunt renal trauma cases based on the classification for renal injury of japanese association for the surgery of trauma 2008's VERSION. Nihon Hinyokika Gakkai zasshi. The japanese journal of urology. 2016;107(1):13-20.
15. LeeVan E, Zmora O, Cazzulino F, Burke RV, Zagory J, Upperman JS. Management of pediatric blunt renal trauma: A systematic review. The journal of trauma and acute care surgery. 2016;80(3):519-28.
16. Güzel M, Arslan S, Turan C, Doğanay S. Management of renal injury in children. Ann Ital Chir. 2015;86(3):246-51.
17. Olivieri C, Grella MG, Catania VD, Contini AC, Briganti V, Calisti A. Pediatric blunt renal trauma with wide fragments dislocation: successful organ saving management by internal stenting and percutaneous perirenal drain. Pediatr Med Chir. 2014;36(5-6):103.
18. Miele V, Piccolo CL, Trinci M, Galluzzo M, Ianniello S, Brunese L. Diagnostic imaging of blunt abdominal trauma in pediatric patients. Radiol Med (Torino). 2016;121(5):409-30.
19. Lin WC, Lin CH. The role of interventional radiology for pediatric blunt renal trauma. Italian journal of pediatrics. 2015;41:76.
20. Reese JN, Fox JA, Cannon GM, Ost MC. Timing and predictors for urinary drainage in children with expectantly managed grade IV renal trauma. J Urol. 2014;192(2):512-7.
21. Au JK, Tan X, Sidani M, Stanasel I, Roth DR, Koh CJ et al. Imaging characteristics associated with failure of nonoperative management in high-grade pediatric blunt renal trauma. Journal of pediatric urology. 2016;12(5):294.e1-6.
22. Başak Uçan A, Günyüz Temir Z, Şencan A, Karkıner A, Evciler H. [Minimally invasive theurapeutic approaches in pediatric nonvascular fourth-grade renal trauma]. Ulus Travma Acil Cerrahi Derg. 2016;22(4):374-8.
23. Okur MH, Arslan S, Aydogdu B, Arslan MS, Goya C, Zeytun H et al. Management of high-grade renal injury in children. European journal of trauma and emergency surgery : official publication of the European Trauma Society. 2017;43(1):99-104.