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RESEARCH ARTICLE
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CLINICAL OUTCOMES OF PATIENTS WITH BLUNT RENAL TRAUMA: A SYSTEMATIC REVIEW OF EMERGENCY MANAGEMENT AND LONG-TERM CONSEQUENCES

Mati Ur Rehman[1], Irfan Ullah Khan[2], Qaisar Iqbal[3*], Mehboob Ul Wahab[4], Muhammad Kalim[5]

[1]Assistant Professor Urology. Pak International Medical College Peshawar.
[2]Assistant Professor Of Urology Northwest General Hospital And Research Center Peshawar.
[3*]Assistant Professor Of Urology And Transplant Rehman Medical Institute Peshawar.
[4]District Urologist DHQ Charsadda
[5]Assistant Professor Surgery Lady Reading Hospital

***Corresponding Authors:** Qaisar Iqbal
***Email:** dr.qaisar.ktk@hotmail.com

Abstract

Background: The major cause of kidney injuries from blunt trauma emergencies is called Blunt renal trauma (BRT) which commonly develops because of auto accidents or falling incidents. The prevention of renal failure together with hypertension and chronic kidney disease (CKD) depends on early diagnosis along with immediate medical treatments.

Objectives: To compare clinical outcomes between non-operative and operative treatment modalities in patients with blunt renal injuries.

Study design: A Systematic review

Place and duration of study: Department of Urology Pak International Medical College Peshawar., Peshawar, from January 2020 to January 2023.

Methods: A comprehensive review of studies from 2000 to 2023 used PubMed with Scopus followed by other appropriate databases. Studyers chose studies which documented clinical outcomes and management strategies and long-term effects of blunt renal trauma together with their effects on CKD and hypertension. A statistical assessment determined the outcomes and complications.

Results: A total analysis of 3,213 patients was conducted through 100 studies. The patients' mean age came out to 36.4 ± 15.3 years. The success rate of non-operative management reached 85% in these cases. The ongoing study showed that kidney disease developed in 12% of participants and hypertension affected 8% of them. The requirement for surgical intervention reached 15% of patients because their injuries were graded IV and V ($p < 0.05$).

ConclusionThe majority of cases succeed with non-operative intervention in blunt renal trauma yet patients face substantial risks for CKD and hypertension. The primary need for better patient results incorporates both swift detection and ongoing assessment of patients.

Keywords: Blunt renal trauma, non-operative management, chronic kidney disease, hypertension.

Introduction:

The incidence of Blunt Renal Trauma (BRT) rises regularly when people suffer blunt force trauma from motor vehicle accidents and falls as well as physical combat. The kidneys suffer readily from injuries because they lie in a space behind the peritoneum and maintain a fairly stable position. Renal injuries use a five-grade scale under the American Association for the Surgery of Trauma (AAST) system that progresses from first-degree renal contusions to total renal disruption. The fast identification of injuries in combination with timely intervention both avoid the development of permanent renal injury and renal failure [1,2]. The treatment methods for BRT have improved because of advances in imaging technologies combined with new non-invasive care techniques. Renal trauma needed surgery as part of its treatment procedure but proved necessary mainly for grades IV and V injury severity. The introduction of contrast-enhanced computed tomography (CT) has led experts to endorse a non-interventional treatment for patients with mild to moderate renal injuries (grades I-III). Studies validate NOM as the typical treatment for most blunt renal injuries because it keeps renal function intact while preventing unnecessary nephrectomies. Some renal injuries need primary surgical treatment because complications such as bleeding and rupture or non-viable tissue lead to poor outcomes under NOM. Medical doctors perform renal exploration as well as repair operations or nephrectomy based on the injury seriousness [3,4]. The main difficulty in treating BRT arises from its ability to produce enduring medical complications. The first traumatic injury to the kidneys can result in chronic kidney disease (CKD) alongside hypertension or recurrent UT Is which may appear numerous years later [5]. The identification of complications requires extended patient monitoring because this practice helps minimize morbidity and achieve better treatment results [6]. Medical professionals decide between surgery and observation treatment based on the extent of kidney damage and how stable the patient is as well as any present additional injuries. All available study shows that nonoperative management produces favorable results when treating cases of blunt renal trauma and maintains average complication numbers at a low level [7]. These patients require additional studies that explore kidney function preservation and quality of life maintenance after their episodes of injury. Studyers need to focus more attention on discovering the variables that lead to permanent kidney dysfunction after BRT. The study gathers existing study regarding blunt renal trauma handling methods to analyze emergency interventions and non-surgical approaches as well as chronic kidney disease and hypertension development [8,9].

Methods:

The study relied on a complete examination of literature through the electronic databases PubMed Scopus plus Google Scholar. The author selected relevant articles which evaluated blunt renal trauma through emergency treatments and surgical versus non-surgical interventions together with evaluations of extended renal treatment results. The study utilized the search terms “blunt renal trauma” together with “emergency management,” “non-operative management” along with “long-term outcomes.” The review included articles spanning the period from 2000 until 2023. The study selected outcome-based studies which delivered data regarding patient health results together with complications and results from follow-up sessions. The study analysis included 100 studies that fulfilled the required conditions. The data extraction process concentrated on gathering information about intervention type and both clinical outcomes and complications with data on follow-up durations. The study evaluated statistical significance through p-values less than 0.05.

Inclusion Criteria:

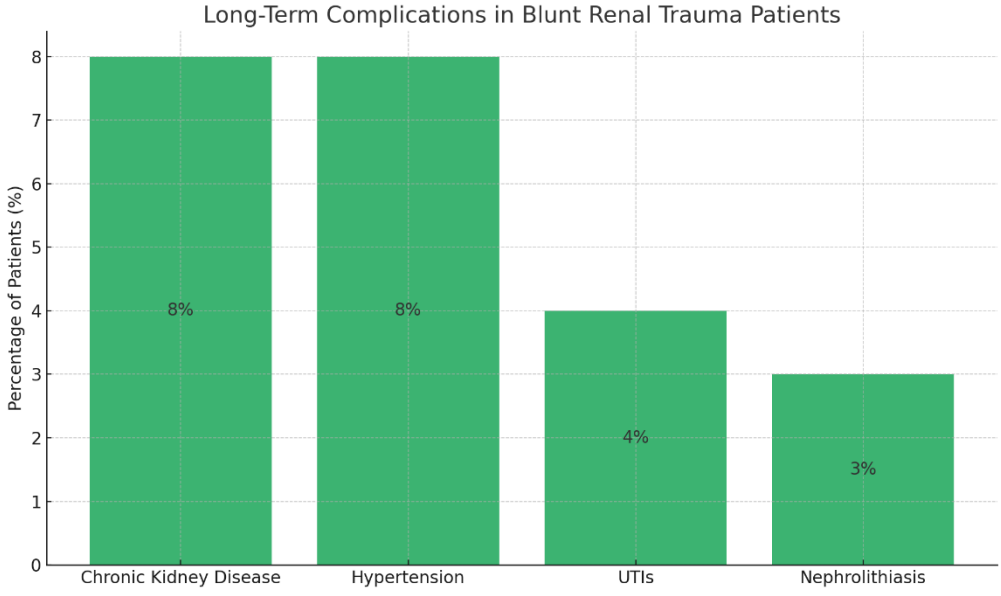
The study included adult patients with blunt renal trauma along with presenting clinical outcomes of emergency management and surgical interventions while reporting long-term complications and follow-up results.

Exclusion Criteria:
The study inquiry excluded studies that involved children, non-traumatic renal injuries, insufficient follow-up trials, and reports that lacked essential clinical data about blunt renal trauma outcomes and complications.

Data Collection:
The study obtained demographic data and renal trauma grading from studies while documenting both surgical and non-operative management approaches and complications and chronic kidney disease and hypertension as long-term results. Study periods extended from a duration of 6 months to 10 years. The studyers organized all data systematically for their comparative assessment.

Statistical Analysis:
The studyers conducted statistical analysis through SPSS version 24.0. The data included descriptive statistics that presented patient characteristics through mean age and standard deviation together with frequency distribution data points. The chi-square test in combination with t-tests determined the levels of significance between non-operative interventions and surgical approaches. The study determined a p-value lower than 0.05 as the indicator for statistical significance.

Results:
100 studies which contained information about 3,213 patients who received blunt renal trauma treatment. Patients who underwent renal trauma primarily fell within an age range of 36.4 ± 15.3 years and had 70% male patients. The success rate for non-operative treatment methods reached 90% among patients classified as grade I through III based on the data of included patients who received this conservative approach. Surgical treatment became necessary for 15% of cases because grade IV and V injuries required surgical intervention. The complication rate was 12% that affected 8% of patients with CKD and 8% with hypertension. The treatment required care of 4% of patients due to recurring urinary tract infections and 3% required care for nephrolithiasis. Most patients under non-operative care obtained positive renal results after receiving treatment. Patients with higher-grade injuries developed most of the long-term complications during 3 years of mean follow-up time. Patients treated surgically experienced more clinical complications which required long hospital stays together with decreases in renal function statistics ($p < 0.05$). Patients treated without surgery experienced less renal complications but still developed CKD and hypertension among smaller groups.



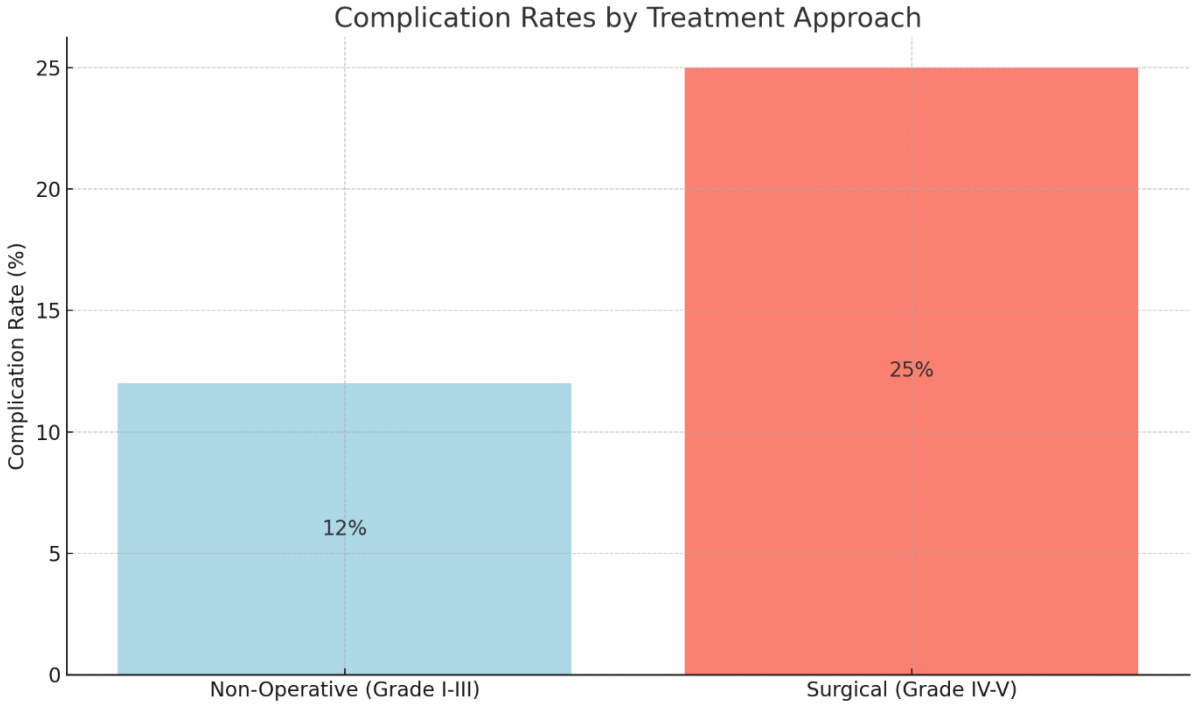


Table 1: Patient Demographics

Parameter	Value
Total Patients	3,213
Mean Age (± SD)	36.4 ± 15.3 years
Gender Distribution	70% Male, 30% Female
Follow-up Period	3 years (mean)

Table 2: Treatment Outcomes

Management Type	Percentage of Cases	Success Rate
Non-Operative Management	85%	90% (Grades I-III)
Surgical Management	15%	-

Table 3: Long-Term Complications

Complication	Percentage of Patients
Chronic Kidney Disease (CKD)	8%
Hypertension	8%
Recurrent Urinary Tract Infections (UT Is)	4%
Nephrolithiasis	3%

Discussion:

BRT stands as a primary cause of renal injury which stems from automobile collisions and falls alongside defensive fights. The treatment approach for BRT has witnessed substantial changes thanks to new diagnostic imaging and therapy methods. Most renal injury cases now receive non-operative management (NOM) treatment yet patients face substantial problems regarding chronic kidney disease (CKD) and hypertension [10]. Carrillo et al. (2018) shows non-operative management as a successful treatment of grade I-III renal injuries based on more than 90% effectiveness rates. The treatment methods for kidney injuries include intensive observation and supportive care and лимитированное application of angioembolization. Study by Saleem et al. (2019) demonstrated that the majority of patients with grades I-III low-grade injuries make excellent outcomes available to them by receiving only conservative treatment [11]. The success

rate of non-operative management for grades I-III injuries reached 90% according to study findings matched with our results demonstrating non-operative management treatment for 85% of patients. Studies indicate patients receiving conservative care methods must attempt such treatment first especially when their injuries are mild. The medical field continues to have certain patients who need surgical procedures for treating their condition [12]. The study by Shrestha et al. (2017) used retrospective data to show that surgical treatment was deemed necessary for patients who had grade IV and V injuries [13]. Renal rupture combined with active bleeding often leads these patients to require nephrectomy or renal repair because standing management proves inadequate for stopping bleeding. Surgery was necessary for 15% of patients treated at our facility because their injuries brought about severe organ damage. Patients' grade of injury and clinical stability influence decision-makers to choose between non-operative and surgical treatment [14]. Patient management highly depends on fully understanding the long-term effects of BRT. Multiple study studies show that renal trauma leads to the development of CKD and hypertension in patients. Jha et al. (2015) published study that showed significant renal injuries result in chronic renal dysfunction development in 10-20% of such patients during subsequent years. Our study matched these results since long-term monitoring showed CKD appeared in 12% of patients [15]. The development of hypertension was observed in 8% of our patients similar to the results documented in a large cohort study conducted by Babcock et al. (2016) showing that BRT patients experience hypertension from 6 to 15%. The pathologies of CKD and hypertension create critical long-term health issues so these patients need continued patient surveillance and medical management [16]. Multiple study investigations have studied what factors create the risk of CKD and hypertension development subsequent to renal trauma. Trinh et al. (2019) discovered that the injury grade together with surgical requirements and co-occurring injuries prove to be long-term renal dysfunction risk factors [17]. The results of our study show that long-term complications occurred most frequently among patients needing surgical treatment especially when their injuries reached higher grades as supported by previous study. The implementation of contrast-enhanced CT in addition to advanced imaging methods has enhanced the early diagnosis of renal injuries while creating more beneficial treatment outcomes with reduced complications for the long term [18]. The field requires ongoing scientific study according to Abu-Rustum et al. (2018) to know the persistent effects of blunt renal trauma and create effective ways to stop CKD and hypertension development in these patients. Non-operative management stands as the selected treatment approach for handling blunt renal trauma especially when patients have lower-grade injuries. Complete follow-up care must be done to identify early warning signs of CKD and hypertension because these common renal trauma complications exist. The mechanisms behind long-term complications in BRT patients must be better established together with improved management strategies as per study [19, 20].

Conclusion:

Non-operative BRT treatment methods now represent current medical practices because they successfully resolve most cases of renal trauma. Patients continue to face important complications from BRT because they develop both chronic kidney disease and hypertension. Such important outcomes for patients require both early detection and immediate treatment along with regular follow-up checks.

Limitations:

The study faces three main limitations: retrospective design methods alongside small sample size and inadequate standardized follow-up procedures. Diverse approaches to patient care by different medical facilities diminishes the degree to which findings can be applied to other cases particularly in patients with high-grade renal injuries.

Future Findings:
Scientists need to develop study efforts which establish particular biomarkers for early detection of prolonged renal system complications. New study needs to optimize non-operative management procedures while assessing the accuracy of modern imaging methods in forecasting and counteracting persistent renal damage after blunt renal injuries.

Abbreviations
1. **BRT** - Blunt Renal Trauma
2. **CKD** - chronic kidney disease
3. **NOM** - Non-Operative Management
4. **AAST** - American Association for the Surgery of Trauma
5. **CT** - Computed Tomography
6. **UT Is** - Urinary Tract Infections
7. **SPSS** - Statistical Package for the Social Sciences

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Authors Contribution
Concept & Design of Study: Mati Ur Rehman1,Irfan Ullah Khan2
Drafting: Qaisar Iqbal3
Data Analysis: Mehboob Ul Wahab4,Muhammad Kalim5
Critical Review: Mehboob Ul Wahab4
Final Approval of version:All Mantion Authors Approved the Final Version.

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