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Research Article

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Percutaneous Catheter Versus Needle Aspiration Of Symptomatic Renal Cyst Under Ultrasound Guidance

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Abstract: Background and Goals: The most common type of renal cystic lesions are simple renal cysts. They are often spherical or oval, one or more, unilateral or bilateral, and contain a clear or straw-colored fluid that resembles plasma. To evaluate the success rate for catheter against needle aspiration in renal cysts and investigate the efficacy of per cutaneous aspiration of uncomplicated renal cysts. Methods: Fifty individuals with mildly symptomatic renal cysts are included in this prospective trial. From February 2024 until June 2025, US-Guided Aspiration was performed as an outpatient operation at the radiology department of Al Sadder Medical City. Using the US criteria for a simple renal cyst, individuals were chosen based only on their symptomatic status. Every patient who was recommended by the urology department completed comprehensive consent papers that included all information regarding the treatment and any potential risks. The patient was created using a unique algorithm, and the data was statistically examined using SPSS version 20, where the chi-square test was used for categorical data and the independent sample T-test on measurement data. P values less than 0.05 are considered significant. Findings: This study included fifty participants with kidney cysts. There were 31 (62%) female patients and 19 (38%) male patients. The average age of the patients was 52.7 (35-77) years. There were 26 (52%) on the left and 24 (48%) on the right. The average diameter of the cysts was 7.68 (4.5–10.5) cm. Cysts aspirated through a needle had a mean diameter of 6.81 cm, whereas cysts drained via catheter had a mean diameter of 8.54 cm. Only 12 out of 50 patients (24%) show symptomatic failure, which indicates that their pain has returned over time, whereas 38 out of 50 patients (76%) typically show symptomatic success, which indicates that their pain was successfully reduced. Conclusions: Simple Percutaneous aspiration of a minor renal cyst can be a minimally invasive, well-tolerated procedure that can be utilized as a first line of treatment for simple renal cysts that are symptomatic and has a relatively high symptomatic success rate. Additionally, neither preparation nor hospitalization are required. A small 5F catheter can be used to drape a small renal cyst, and it works better than aspirating it using a needle. It can also be used for larger renal cysts.

Keywords: Percutaneous catheter; Needle aspiration; Symptomatic renal cyst; and Ultrasound guidance.

INTRODUCTION

The most common type of renal cystic lesions are simple renal cysts. They are typically spherical or oval, one or more, unilateral or bilateral, and contain a clear and straw-colored fluid that resembles plasma (Clayman, R. V. *et al.*, 1984). They are not directly related to any nephron component (Hanna, R. M., & Dahniya, M. H. 1996). They could, however, start off as a part of the nephron. Simple cysts can develop at any time, including during pregnancy. The rate of simple renal cysts is relatively constant between birth and age 18 (ranging from 0.1% over 0.45%, with an average of around 0.22%). In contrast, as humans age, the proportion increases to 20% at age 40 and as high as 50% beyond age 60 (Eissa, A. *et al.*, 2018; Silverman, S. 2019; Egilmez, H. 2007; Chung, B. H *et al.*, 2000; Zhang, X. *et al.*, 2020; Cheng, D. *et al.*, 2012; Okeke, A. *et al.*, 2003). Although at least two research revealed that males were more impacted than women, the majority of publications claim that there does not exist gender preference (Sandler, C. *et al.*, 1986). In unilateral, cortical, and solitary cysts, they range from 70 to 80%. As people age, their laterality, and the number of the same kidney both increase. Simple cysts are often cortical cysts that develop outside the parenchyma and press on it, causing the renal shape to be distorted (Souftas, V. D. *et al.*, 2015; Cho, Y. J., & Shin, J. H. 2016). They adopt a round or oval form, always maintaining a smooth-limbed, strongly defined border. Usually smooth, translucent, avascular, and yellowish or bluish white, the cyst wall is made up of a single layer of flattened and cuboidal epithelia lining a thin layer with fibrous tissue. They contain a uniform transudate-like fluid that is transparent or straw-colored, has a radiodensity as 10 to 20 Hounsfield units (HU), which is almost the radiodensity of water, and has extremely low viscosity. There is no communication between the collecting system and the parapelvic cysts (Demir, E. *et al.*, 2007; Kwon, S. H. *et al.*, 2007; Seo, T. S. *et al.*, 2000). Cysts seldom cause symptoms on their own in adults or children. When cysts are big, they can cause discomfort or an abdominal mass; they can also burst spontaneously into the pelvicalyceal system, often causing hematuria; they can induce hypertension; and they can cause segmental

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ischemia. Cysts may cause renal pelvic obstruction or calyceal obstruction. They might or might not get bigger. Rarely, a cyst infection may occur, which is a very hazardous side effect that causes a patient to have fever, flank discomfort, and frequently a sympathetic pleural effusion (Bean, W. J. 1981; Gasparini, D. 2003; Canguven, O. *et al.*, 2009).

PATIENTS AND METHODS

Fifty individuals with mildly symptomatic renal cysts are included in this prospective trial. From February 2024 until June 2025, US-Guided Aspiration was performed as an outpatient operation at the radiology department of Al Sadder Medical City. Using the US criteria for a simple renal cyst, individuals were chosen based only on their symptomatic status. Single kidneys, pregnant individuals, and complex renal cysts were not included. Every patient who was recommended by the urology department completed comprehensive consent papers that included all information regarding the treatment and any potential risks. To rule out other possible causes of discomfort, such as kidney stones, a clinical history and ultrasound examination were performed prior to the treatment. A simple renal cyst was aspirated while being guided by ultrasonography (TOSHIBA XARIO TA510). The remaining 25 patients were aspirated using a 5F or 6F angiographic catheter, while the remaining 25 patients were aspirated using a tiny needle (CSF needle G20). Following the identification of the puncture site, 2% lidocaine hydrochloride (5 ml) was administered for local anesthetic and antiseptic preparation. Using the Seldinger method, a tiny catheter was placed through a 5-mm incision in the majority of the patients while being continuously guided by ultrasonography. After taking all necessary precautions to fully aspirate the cyst, the patient had another ultrasound scan to quantify the remaining cavity and ensure that the aspiration was successful. When the drain stopped emptying after two to three hours, the catheter was withdrawn from the patient. The patient was sent home after recovering for thirty minutes. During the surgery, only a basic analgesic was given if necessary; no antibiotic was provided. Due to a color shift in the aspirated fluid, two patients experienced intracystic bleeding during the surgery. The bleeding was stopped right away, and no further care was required. Two further patients experienced a single incident of insignificant macroscopic hematuria, which was treated with follow-up and reassurance. For six-month cycles, the US conducted follow-ups on all patients at monthly intervals. The patient was created using a unique algorithm, and the data was statistically examined using SPSS version 20, where the chi-square test was used for categorical data and the independent sample T-test on measurement data. P values less than 0.05 are considered significant.

RESULTS

Fifty individuals with renal cysts participated in this investigation. As seen in Figure 15, there were 19 (38%) male patients and 31 (62%) female patients. The patients were 52.7 (35-77) years old on average. The left side had 26 (52%) and the right side had 24 (48%). Cysts had an average diameter of 7.68 (4.5–10.5) cm.

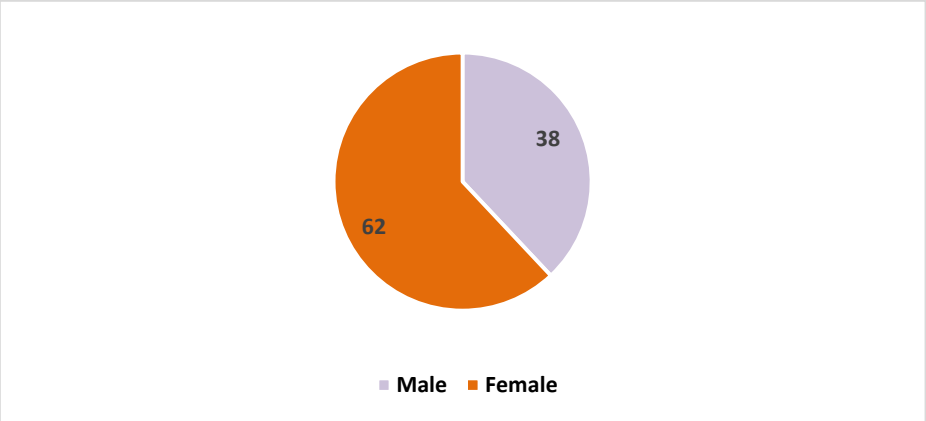

Fig 1. Sex distribution of the study samples.

Table 1. The relation between the type of procedure and the size of the cyst.

	Aspiration	Mean	Range	P value
Diameter of cyst (cm)	C	8.54	7-10.5	<0.001
	N	6.81	4.5-8.5	

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Table 2. The relation between the type of aspiration and the success rate.

		success of aspiration		P value
		Success	Failure	
Aspiration	C	16	9	0.048
		64.0%	36.0%	
	N	9	16	
		36%	64%	
Total		25	25	
		50%	50%	

The size of the cyst and operation success have a strong inverse association, as shown in Tables 3 and 4 (P-value = 0.018 for the catheter and 0.002 for the needle, respectively). The procedure's success rate drops as the size of the cyst increases.

Table 3. Relation between the results of catheter drainage and the size of cysts.

	Catheter Drainage	**Mean**	**SD**	**P value**
Diameter of Cyst/cm	Success	7. 563	0.88	0.018
	Failure	9.0556	1.26	

Table 4. Relation between the results of needle aspiration and the size of cysts.

	Needle aspiration	Mean	SD	P value
Diameter of Cyst/cm	Success	6.1273	0.94243	0.002
	Failure	7.3607	0.78328	

Table 5. The relation between the results of the procedure and gender.

		Result of procedure		**P value**
		Success	Failure	
Gender	Male	10	9	0.77
		52.63%	47.37%	
	Female	15	16	
		48.4%	51.6%	
Total		25	25	
		50%	50%	

Table 6. The relation between age and the results of catheter aspiration.

	Results of aspiration	Mean	SD	P value
Age/ years	Success	52.5000	9.02589	0.365
	Failure	56.4444	12.21793	

As seen in Table 7, 38 out of 50 patients (76%) generally exhibit symptomatic success, meaning that their pain has been successfully relieved, whereas only 12 out of 50 patients (24%) exhibit symptomatic failure, meaning that their pain has returned over time.

Table 7. The relation between age and the results of needle aspiration.

	results of aspiration	Mean	SD	P value
Age/ years	Success	47.5455	9.45900	0.116
	Failure	54.6429	11.71854	

Table 8. The relation between the type of aspiration and pain recurrence.

		Aspiration		P value
		C	N	
Pain	Yes	5	7	0.508
		20.0%	28%	
	No	20	18	
		80.0%	72%	
Total		25	25	
		100.0%	100.0%	

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Table 9. Complications of the procedure.

Complications	No. of cases in needle aspiration	No. of cases in catheter drainge
Hemorrhage	1\25 (4%)	1\25 (4%)
Macroscopic Hematuria	1\25 (4%)	1\25 (4%)
Total	2\25 (8%)	2\25 (8%)

DISCUSSION

Usually, simple renal cysts form in a kidney with an epithelial lining devoid of any renal components, and that is otherwise productive. Because of their inherent unilocularity, the cysts cannot attach to the collecting system (EL-DIASTY, T. A. 1995). The vast majority of simple kidney cysts are asymptomatic and may not require treatment. The most common first symptom is flank pain or discomfort. In recent years, percutaneous therapy-based minimally invasive approaches have gained popularity for treating symptomatic renal cysts (RM, H. 1996). Especially for patients with generally deteriorated circumstances, percutaneous puncture of cysts according to CT or ultrasound guidance, having aspiration for their contents, is a straightforward treatment with a minimal risk of complications, especially in outpatient settings. Because ultrasound guidance is accessible and exposes less radiation, most authors recommend its use for these procedures (WOLF JR, J. S. *et al.*, 1998; Aboutaieb, R. *et al.*, 1995; Ham, W. S. *et al.*, 2008; Egilmez, H. *et al.*, 2007).

The size of the cyst and the procedure's success have a significant inverse association in this study (p-values for catheter as well as needle aspiration are 0.018 and 0.002, respectively). (Gasparini, D. *et al.*, 2003; De Dominicis. *Et al.*, 2001) Studies carried out in the USA also found a substantial correlation between the procedure's success and the size of the cyst. Different sclerosing agents are employed in other studies for percutaneous cyst aspiration according to ultrasound guidance to destroy the cyst epithelium and reduce the recurrence rate. Depending on the size of the cyst, 99% alcohol is the most commonly utilized sclerosing agent for single and many sessions. Percutaneous needle aspiration for renal cysts with a single session sclerosing agent (99% alcohol) is used in studies conducted by British authors (Gasparini, D. *et al.*, 2003; De Dominicis, C. *et al.*, 2001; Falci-Junior. *Et al.*, 2005). The corresponding success percentages were 57%, 69.6%, 73%, and 68%.

A single session of 99% alcohol is employed as a sclerosing agent in other trials conducted in Canada, Australia, and India [28 – 30] that use percutaneous catheter drainage of the cyst for 24 hours to completely empty the cyst and avoid alcohol dilution by leftover cyst fluid. The corresponding success percentages were 90.5% and 93%. In contrast to research conducted in Iran, where the symptomatic success rate was 80.5%, the symptomatic success rate in this study (pain-free patients regardless of cyst recurrence) was 70% for needle aspiration and 80% for catheter drainage.

Procedure-related complications are uncommon and often resolve on their own. Hemorrhage into the cyst occurs in 2/50 (4%), as does hematuria in 2/50 (4%). In all, 4/50 patients (8%) have these problems from needle and catheter aspirations, and all are treated conservatively (Touloupidis, S. *et al.*, 2004). According to a French research (Paananen, I. *et al.*, 2001) 10% of patients treated with percutaneous aspiration experienced moderate consequences, such as discomfort, temporary macroscopic and microscopic hematuria, and fever, whereas 0.75–1.4% experienced significant difficulties, with perirenal hemorrhage being by far the most frequent. No significant difficulties were found in this study, which may be because of the limited sample size and local experience, whereas 84 institutions recorded 5674 instances in the Greek survey (Mohsen, T., & Gomha, M. A. 2005).

CONCLUSION

Easy with a comparatively high symptomatic success rate, percutaneous aspiration of a simple renal cyst is a minimally invasive, well-tolerated technique that may be used as a first line of treatment for symptomatic simple renal cysts. It also does not need preparation or hospitalization. Also, using a tiny 5F catheter to drape a basic renal cyst produces better outcomes than aspirating it with a needle, and it may be employed for bigger renal cysts.

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