Asian Journal of Surgery 47 (2024) 3077–3078

Contents lists available at ScienceDirect

Asian Journal of Surgery

journal homepage: www.e-asianjournalsurgery.com

Letter to Editor

Clinical application of ultrasound-CT image fusion technology in percutaneous nephrolithotripsy

To the editor,

Upper urinary tract stones are a common urinary system disease, and minimally invasive percutaneous nephrolithotripsy is a commonly used surgical method for the treatment of upper urinary tract stones.[1] It has the advantages of small trauma, fast recovery, and accurate results. The overall efficacy depends on preoperative examination to assist in locating the appropriate puncture point and direction, in order to create a reasonable percutaneous renal channel.[2,3]

Ultrasound guided puncture localization is a routine method for percutaneous nephrolithotripsy, but it is difficult for beginners and requires experienced clinical physicians to perform the operation.[4] CT is one of the important diagnostic methods for urinary system diseases, which can clearly display the location, size, and morphology of urinary system lesions, guiding clinical diagnosis. Ultrasound CT multimodal image fusion technology is a newly developed technology.[5] The purpose of this study is to analyze the clinical application safety and reliability of image fusion ultrasound technology in percutaneous nephrolithotripsy, in order to provide a safer and more effective plan for patient puncture.

In this study, we randomly divided 64 patients with complex kidney stones (diameter greater than 2 cm) into an experimental group and a control group. Both groups of patients underwent ultrasound-guided percutaneous nephrolithotripsy for stone removal. The experimental group used CT-US technology (Fig. 1), while the control group used conventional ultrasound puncture technology. We recorded the puncture time, overall surgical time, bleeding volume, overall hospital stay, as well as the occurrence of adverse reactions such as fever and renal colic in the experimental group and control group, respectively. Patients were re examined 4 weeks after surgery to evaluate the stone clearance rate in both groups.

It was found that a total of 4 patients lost follow-up throughout the entire study, and a total of 60 effective cases were recorded, with 30 patients in each group. There was no statistically significant

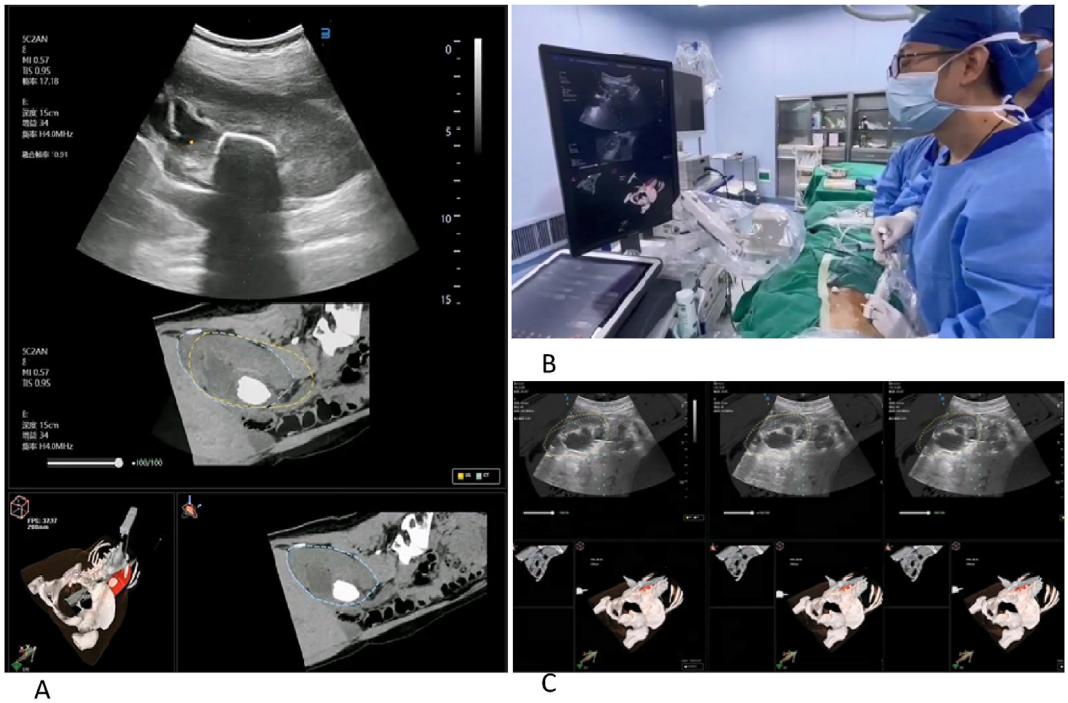

Fig. 1. Clinical application of ultrasound-CT image fusion technology in percutaneous nephrolithotripsy

https://doi.org/10.1016/j.asjsur.2024.02.124

difference in baseline data. The stone clearance rate of the experimental group patients was 96.55%, which was higher than that of the control group (87.5%), and the difference was statistically significant ($P < 0.05$). The puncture time, surgical time, overall hospital stay, and intraoperative and postoperative bleeding of the experimental group patients were all lower than those of the control group, and the differences were statistically significant ($P < 0.05$). The adverse reaction rates of fever and renal colic in the two groups were not statistically significant ($P > 0.05$).

For patients with upper urinary tract stones who require minimally invasive percutaneous nephrolithotripsy, image fusion ultrasound assisted localization can shorten the surgical time and postoperative recovery time, reduce surgical blood loss, improve puncture success rate and stone removal rate, while not increasing the incidence of complications in patients. The clinical application of CT-US technology in percutaneous nephrolithotripsy has significant therapeutic effects and is safe and reliable. It can effectively and safely perform puncture, and has significant advantages in shortening surgical time, reducing hospitalization time, and reducing intraoperative and postoperative bleeding.

Funding declaration

This work was supported by Pudong New Area Health System Outstanding Young Medical Talents Training Program [grant number PWRq2021-29] ; and General project of Pudong New Area Health Committee [grant number PW2021A-44]; Pudong New Area Traditional Chinese Medicine Inheritance, Innovation and Development Demonstration Pilot Project, Pudong New Area Collaborative Traditional Chinese and Western Medicine Flagship Department (Urology) Construction Program Funding [No: YC-2023-0405].

Declaration of competing interest

None.

References

1. Jun L, Jie G, Wenkuan X, et al. Efficacy and safety of percutaneous nephrolithotripsy in elderly patients: a retrospective study. *BMC Surg*. 2022;22(1):392, 392.
2. ShaoWei X, MingBo Z, YuKun L, et al. A comparative study of ultrasound-guided percutaneous nephrolithotripsy and x-ray-guided percutaneous nephrolithotripsy in the treatment of complex renal calculi without hydronephrosis. *Pakistan J Med Sci*. 2022;38(8):2259–2265.
3. Han W, Ge J, Xu X. Comparison of the Efficacy and Complications of Soft Ureteroscopy Lithotripsy and Percutaneous Nephrolithotomy in the Treatment of Urinary Calculi: A Systematic Review and Meta-analysis. *Comput Math Methods Med*. 2022 Jul 1;2022:5829205.
4. Baoquan X, Dong L, Peng L, et al. *The Application of Ultrasound-CT Fusion Navigation Technology in Complex Bone Tumor Biopsy:*A Randomized Double-Blind Controlled Trial*. World neurosurgery; 2023 [J].
5. Silvia M, Andrea C, Anita O, et al. Combined ultrasound-CT approach to monitor acute exacerbation of interstitial lung disease. *Ultrasound J*. 2020;12(1):27.

He Zhang[1], Wenwen Liang[1], Yiyang Liu, Zhong Wang[*]
Department of Urology, Gongli Hospital of Shanghai Pudong New Area, 219 Miao Pu Road, Shanghai, 200135, China

University of Shanghai for Science and Technology, Shanghai, 200135, China

[*] Corresponding author. Department of Urology, Gongli Hospital of Shanghai Pudong New Area, Shanghai, 200135, China.
E-mail address: wangzhong202301@163.com (Z. Wang).

6 January 2024
Available online 8 March 2024

[1] These authors contributed equally to this work.