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Diagnostic Value of Superb Microvascular Imaging in Testicular Torsion-A Case Report

Turgay Kara[1*], Halil Ibrahim Sara[1], Muhammed Sami Coban[1], Mehmet Sedat Durmaz[2] Funda Gokgoz Durmaz[3], Ender Alkan[4]

[1]Department of Radiology, University of Health Science, Konya Trainning and Research Hospital, Konya, Turkey, [2]Department of Radiology, Selçuk University Medical Faculty, Turkey, [3]Karatay Community Health Center Department of Family Medicine, Konya, Turkey, [4]Aksaray University, Training and Research Hospital Department of Radiology, Turkey.

trgykr@gmail.com.tr

***Corresponding Author:** Turgay Kara, MD, Department of Radiology, University of Health Science, Konya Trainning and Research Hospital, Konya, Turkey.*

Abstract

Testicular torsion accounts for 25–35% of pediatric scrotal emergency; thus, early diagnosis is crucial to avoid testicular loss due to the severity of ischemia depending on the torsion duration. Sometimes, it is difficult to make a definite diagnosis with conventional Doppler imaging techniques (Color Doppler(CD), Power Doppler (PD)) especially in pediatric patients in small testes volume. In this patient group, testis torsion diagnosis cannot be made because no vascular flow can be observed on normal and affected sides via CD and PD examinations, because the testes volume is small. Superb micro-vascular imaging (SMI), an innovative new Doppler technology designed to overcome the limitations of conventional Doppler imaging techniques, is used to determine microvascular blood flow. In such cases, by adding SMI to the examination, testis torsion diagnosis can be made earlier with high accuracy. In this case, due to failure to observe vascular flow via SMI on the affected side of a 5 year old patient, he was diagnosed with intravaginal torsion undoubtfully in a short period of time by showing the intratesticular vascular flows on the normal side, and the intravaginal torsion diagnosis was verified by surgery.

Keywords: *Intratesticular vascular flow, Superb microvascular imaging, testicular torsion*

Introduction

Testicular torsion accounts for 25–35% of pediatric scrotal emergency; thus, early diagnosis is crucial to avoid testicular loss due to the severity of ischemia depending on the torsion duration (1). Sometimes, it is difficult to make a definite diagnosis with conventional Doppler imaging techniques (Color Doppler (CD), Power Doppler (PD)) especially in pediatric patients in small testes volume (1) (2). In this patient group, testis torsion diagnosis cannot be made because no vascular flow can be observed on normal and affected sides via CD and PD examinations, because the testes volume is small (3). Superb micro-vascular imaging (SMI), an innovative new Doppler technology designed to overcome the limitations of conventional Doppler imaging techniques, is used to determine microvascular blood flow (4). In such cases, by adding SMI to the examination, testis torsion diagnosis can be made earlier with high accuracy (5).

Case

A 5-year-old patient who was admitted to our hospital with the complaint of severe right scrotal pain that had recently started. His complaint did not relieve with elevation of the testes, no kreamaster reflex was detected, and the painful testes was above compared to the other one.

There was no testicular blood flow on both testes with color and power Doppler **(Figure1).**

There was no testicular blood flow on the affected side with color and monocrom SMI **(Figure2)**, and normal blood flow was seen in the testicular vascular

structures on the other side (Figure3). The right testicular torsion was diagnosed with these findings.The diagnosis of intravaginal torsion was confirmed by surgery.

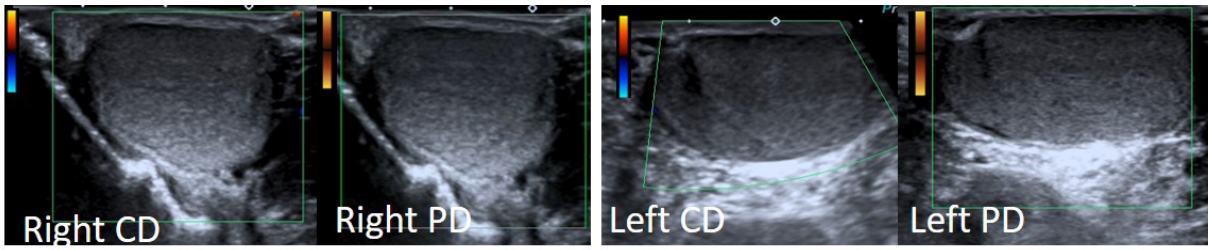

Figure 1. *There was no testicular blood flow on both testes with color Doppler (CD) and power Doppler (PD).*

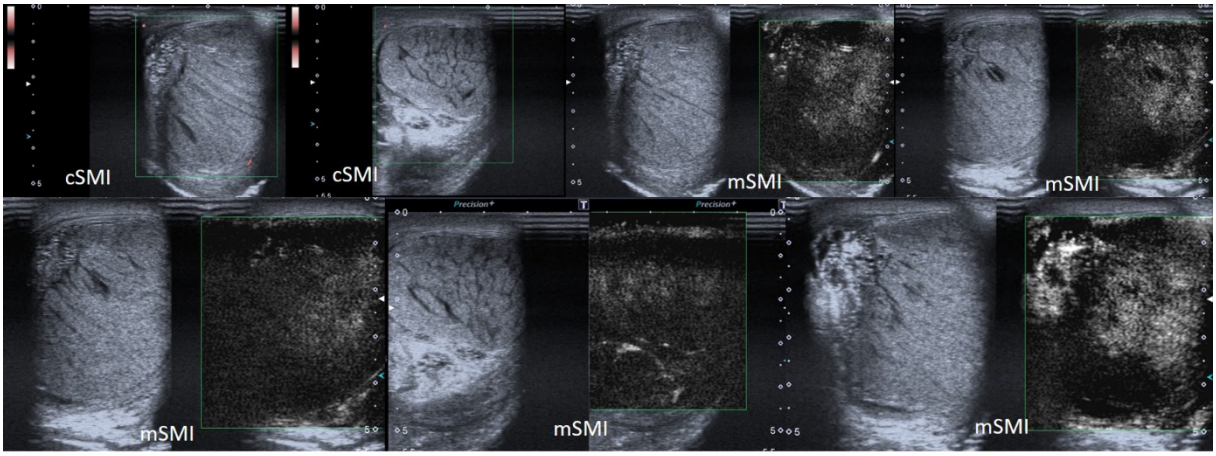

Figure 2. *Color In the SMI and monocrom SMI examination, blood flow is not monitored in the right testis. Because it can reliably demonstrate microvascular structures and low flows, the absence of blood flow in the right testis in the SMI examination strongly supports testicular torsion.*

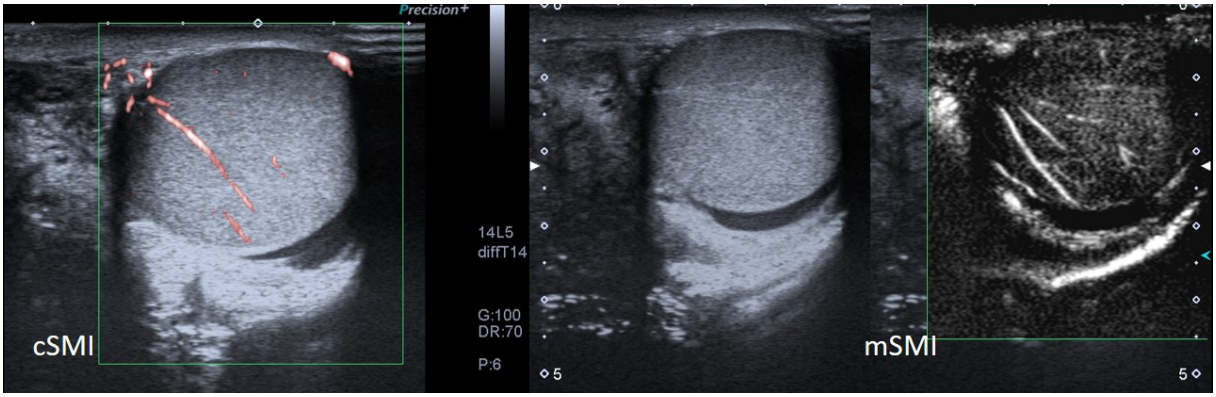

Figure 3. *Color In the SMI and monocrom SMI examination, blood flow is monitored in the left testis. The presence of flow on SMI in left testis unlike right strongly supports right testicular torsion.*

Discussion

Testicular torsion requires immediate surgery to save the testicle (6). If testicular torsion goes on for more than a few hours, it can permanently damage the testicle, and a damaged testicle must be removed (7).

Unilateral scrotal pain of sudden onset is commonly due to acute testicular torsion, where in the testicle suddenly spins in the scrotum twisting the blood vessels to the testicle and halting testicular blood flow (8). Forevery 100,000 males less than 25 years of age, about 4.5 males will have testicular torsion per year (9). Time is of the essence for this urological emergency, since pain lasting more than 4 to 8 hours is highly associated with testicular death if no intervention occurs (9). Unfortunately, at surgical exploration, one third of testes will be considered dead and orchiectomy is performed. (9) (10) (11). For salvaged testes, many

may have damage with diminished testicular size after healing is complete, with possible contralateral testis injury as well.

Radiological evaluation of testicular blood flow can be very difficult to assess, especially in young children. Color doppler imaging has been reported to be inadequate for diagnosis, especially in children (12) (13) (14). Contrast enhanced MRI or CT can be used to assess blood flow. However, these tests are expensive and can be difficult to apply in children. Because of the danger of necrosis and infertility it is important to evaluate the testes quickly and accurately especially in patients with acute scrotal pain.

While conventional Doppler techniques such as color and power Doppler can show macro blood flow, the ability to show micro blood flow has been limited since the introduction of filters to eliminate tissue motion artifact sand noise (5) (15). In other words, conventional Doppler techniques cannot distinguish between low-speed flow sand motion artifacts (5).

Contrast enhanced US techniques have been reported to be useful in assessing micro blood flow in the testes and contributing to the diagnosis. However, there are some limits on the use of contrast enhanced US (12).

SMI is an innovative doppler technique for determining micro vascular blood flow and overcoming the limitations of conventional doppler techniques (4). The Doppler signal is generated by both blood flow and tissue movement. In the conventional Doppler technique, strong motion signals suppress low blood flow signal sand the primary image consists of high-speed blood flows

On the other hand, in the SMI technique, tissue movement signals are reduced and low-speed blood flows are detected. As a result, high-speed and low-speed flows form the image in SMI technology.

SMI allows the visualization of minute vessels with low velocity flow signals with a high image resolution and high frame rate (> 50 fps). It can be run in two modes: color SMI (cSMI) and monochrome SMI (mSMI). The cSMI mode achieves conventional grayscale US images with color-coded Doppler signals at the same time. The mSMI mode only focuses on the vascular signals and eliminates the background signals and enables the visualization of the vascular structures.

Studies have shown that SMI technique is superior to conventional doppler techniques in evaluating testicular blood supply (16) (5). This superiority is more pronounced especially when the testicular volume decreases (16). When cSMI and mSMI were compared, it was seen that mSMI was superior in all age groups and this superiority became more pronounced as testis volume decreases (16).

In our case, consistent with our SMI experiences, we found that normal and torsional testicular blood supply can be evaluated more accurately with SMI than conventional doppler techniques. In testicular torsion, especially pediatric patients may not allow optimal examination tecnique and duration due to excessive pain and sensitivity. We think that SMI examination should be performed routinely because it reduces motion artifacts in torsion evaluation and shows flows at low speed so that such reasons do not cause misdiagnosis.

Conclusion

Torsion is a condition that requires rapid diagnosis and treatment to avoid ischemia. SMI is a fast and highly reliable and superior to other vasculary imaging techniques in demonstrating testicular blood flow. The absence of blood flow in the SMI examination strongly supports testicular torsion.

References

[1] Baker LA et al. An Analysis of Clinical Outcomes Using Color Doppler Testicular Ultrasound for Testicular Torsion., Pediatrics. 2000;105:604-7.

[2] Liu Chia-Chu et al. Clinical Presentation Of Acute Scrotum In Young Males. The Kaohsiung Journal of Medical Sciences. 2007; 23(6);281-286.

[3] Singhal A et al. Neonatal testicular torsion with an unusual sonographic feature. Journal of Clinical Ultrasound.2012;40:243–246.

[4] Hata J. Seeing the unseen new techniques in vascular imaging; superb micro-vascular imaging. Toshiba Medical Systems Corporation. Online 2014. http://www.toshibamedicalsystems.com/library/

[5] Karaca L. et al. Comparison of the superb microvascular imaging technique and the color Doppler techniques for evaluating children's testicular blood flow. European Review for Medical and Pharmacological Sciences. 2016; 20 :1947-1953.

[6] Smith RD. Testicular torsion:Time is the enemy. ANZ Journal of Surgery. 2002;72:316–318.

[7] Dunne PJ, O'Loughlin BS. Testicular Torsıon: Time Is The Enemy. Australian and New Zealand Journal of Surgery. 2000;70(6):441-2.

[8] DaJusta, D. Et al. Contemporary Review of Testicular Torsion: New Concepts, Emerging Technologies and Potential Therapeutics. Journal of Pediatric Urology, 2013;9(6):723.

[9] Mansbach JM, Forbes P, Peters C. Testicular torsion and risk factors for orchiectomy., Archives of pediatric & adolescent medicine. 2005;159(12): 1167-1171.

[10] CostNG. et al. Pediatrictesticulartorsion: demographics of national orchiopexy versus orchiectomy rates. The Journal of Urology. 2011;185:2459-63.

[11] Cubillos J. et al. Familial testicular torsion. The Journal of Urology. 2011;185(6): 2469-72.

[12] Lung PF. et al. Contrast-enhanced ultrasound in the evaluation of focal testicular complications secondary to epididymitis.American Journal of Roentgenology 2012;199(3) 345-354.

[13] Matteson JR et al. Medicolegal aspects of testicular torsion. Urology. 2001;57(4): 783-6.

[14] Dogra VS. et al. Torsion and beyond: new twists in spectral Doppler evaluation of the scrotum. Journal of Ultrasound in Medicine.2004;23(8): 1077-85.

[15] Ingram S, Hollman AS. Colour Doppler sono graphy of the normal paediatric testis. Clinical Radiology.1994;49:266–7.

[16] Durmaz MS, Sivri M. et al. Comparison of superb micro-vascular imaging (SMI) and conventional Doppler imaging techniques for evaluating testicular blood flow. Journal of Medical Ultrasonics. 2018;45(3): 443-52.

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