

Summary & Conclusion

Several imaging techniques are available for use in the detection of bladder pathology. U/S, CT, MRI and conventional cystoscopy could be used in diagnosis the bladder disease. Conventional cystoscopy is accepted as a gold standard in diagnosis of urinary bladder diseases.

Recently, three-dimensional computer – rendering techniques with rapid image acquisition have led to the development of virtual reality imaging. With commercially available software, virtual reality imaging allows interactive intramural navigation through any hollow viscus, simulating conventional endoscopy. Recently CT-virtual endoscopy has been introduced to the imaging armamentarium for use in the evaluation of urinary bladder. The Urinary bladder is a good candidate for virtual endoscopy because of its simple luminal morphology, relatively small volume and absence of involuntary peristalsis.

CTVC technique is of a great value in detection of bladder tumors larger than 5 mm with high sensitivity, specificity and accuracy rates.

But recently high sensitivity rates for detection of bladder lesions less than 5 mm by VC have been reported by many authors such as **(O'Connor et al., 2008)**.

CTVC may be performed in several ways, including instilling gas and/or iodinated contrast material into the bladder prior to CT scanning, however, compared with virtual cystoscopy of the air-filled bladder, virtual cystoscopy of intravenous contrast material filled bladder has some advantages as it is safer and more comfortable for the patient because bladder catheterization is not necessary. On the other hand filling the bladder with intravenous contrast material has been easily achieved; radiation dose can be halved as CT data are obtained only

once whereas virtual cystoscopy of an air filled bladder reacquires two sets of CT data obtained with patient in supine and prone position. In addition, virtual cystoscopy can be performed as part of routine contrast enhanced CT and thus a satisfactory evaluation of the entire urinary tract can be obtained with only one examination.

Generally speaking CTVC has several advantages over conventional cystoscopy: It is much less invasive, much less time consuming, requiring less equipments with fewer patient preparation steps, can be performed without radiographic contrast (when CO₂ or air is used in the bladder), allowing intraluminal viewing of the bladder from any angle permitting complete visualization of the bladder neck, trabeculation and diverticula. Diagnostic benefits of CTVC compared with conventional cystoscopy include its ability to accurately record tumor maximum dimensions and volume without magnification or distortion.

Patients with a severe urethral stricture or marked prostatic hypertrophy, who may be poor candidates for conventional cystoscopy, can safely undergo CTVC.

Of special interest is the technique of color mapping, which may optically facilitate distinction between normal and pathologic conditions.

Virtual Cystoscopy with color mapping contributes more comprehensive informations, because it is not restricted to the surface and takes changes of the entire wall thickness into account.

Tumors, benign wall thickening and normal wall thickness are correctly identified by using axial source images and virtual cystoscopy with color mapping. The 3D models with color mapping are excellent at

indicating how far tumors had infiltrated. However, the color mapping is sensitive to artifacts.

On the other hand several disadvantages were reported regarding CTVC, although areas of wall thickening are seen on virtual images, they are more conspicuous on the transverse views. The calcifications associated are seen only on the transverse images and not on the virtual images. False-positive finding of lesion may be reported due to air bubble in bladder.

Many artifacts were also reported in technique of CTVC of the contrast material- filled bladder when urine and contrast could not be mixed properly.

Data acquisition should be performed in a helical mode with a single breath hold to eliminate breathing motion artifact.

So, transverse and virtual views are complementary in lesion detection and characterization; therefore, sets of both these images should be used for accurate lesion detection.

There are several important limitations of virtual cystoscopy. A major limitation is that it is unable to depict flat lesions. In addition, mucosal thickening secondary to fibrosis can not be distinguished from a neoplasm. Another disadvantage of virtual cystoscopy is that it lacks the ability to provide tissue for histological evaluation, an ability that is possible with conventional cystoscopy and biopsy.

Limitations of virtual cystoscopy of the contrast material filled bladder include contraindication of the modality for the patient who can not tolerate contrast material injection.