Editorial referring to the paper published in this issue on pp. 136–141

UROLOGICAL ONCOLOGY

From industrial laboratory directly to operating table: the vicissitudes of optical coherence tomography (OCT)

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The current issue of the CEJU runs a paper presenting the prospect of an amazing, unconventional diagnostic method. Optical coherence tomography (OCT) is a relatively new interferometric technique of optical imaging [1]. Though physical foundations of OCT are difficult to grasp for a run–of–the–mill kind of CEJU reader (editor alike), Dr. S. Kharchenko and co–workers' paper deserves our notice. This technique has been developed in the Massachusetts Institute of Technology twenty years ago and now OCT emerges as a powerful supplementary tool for uro–oncology. We can be really moved by amazing 3–D scans of tissue structure that are almost comparable to microscopic pictures.

Briefly, while our everyday USG diagnostic scanner analyzes ultrasounds emitted by a transducer and next scattered by and reflected from tested objects (e.g. kidney), OCT uses low coherent infrared light emitted by a superluminescent diode [1, 2]. Light waves penetrate transparent objects (like some living tissues) and are reflected by its structures. After complex processing, time delay and intensity of echoed waves are expressed as 3–D images (grey or color)giving in–vivo "histologic" images of a given tissue architecture [2]. For clinicians, the most interesting and useful feature of OCT is its capability to penetrate non–transparent tissues, although at a millionth of a meter's range [1, 2]. At first, OCT has been implemented in ophthalmology for retina diagnostics, then in angiology for in–vivo detection of atherosclerotic plaque formation or evaluation of intravascular stents. Further developments paved the way for intravascular OCT devices [2]. The OCT potential to scan tissues in–vivo with near microscopic resolution opens new frontiers in many fields of clinical medicine. For instance, it could be useful in characterization of indeterminate tumors or in the assessment of the extent of pathologic changes in tissues [3]. In addition to medical applications of OCT that are taken into account, many industrial applications also emerge: characterization of solid or liquid materials, assessment of surface damages or deformations, etc. [4, 5].

This paper reviews OCT application within the scope of urology and it seems obvious that urinary tract diagnostics and treatment should benefit from it. Usability ranges from the "optical biopsy" of suspected lesions to the assessment of borders of surgical incision. However, it is hard to agree with the authors' opinion that: "…diagnostics based on biopsies is prone to sampling errors, which in turn cause high false negative rates" and with the further suggestion that this technique may be a match for histopathology [6]. It sounds too emotional even for OCT proponents.

Thorough analysis of available scientific literature concerning OCT and of the discussed article brings the multifarious applications of this method to reader's mind – in surgery and urology in particular. It's enough to imagine the incredible possibility offered by surgical devices coupled with OCT scanners. Authors mentioned that OCT–assisted laparoscopic nephron–sparing procedures had been done already. What's more, there is plenty of scope for the broadening of applications. Nerve sparing prostate surgery should reap profits from that combination. As of now, the first steps have been reported for laparoscopic and robot–assisted prostatectomy – this paper refers to Dr. Feldchtein and co–workers' poster during the twenty–first Engineering and Urology Society Annual Meeting (see ref. 15). Current live imaging in urology is still controversial so OCT may be a promising alternative to cystoscopy with photosensitizing agents.

To recap, this review reveals that progress in medicine has no frontiers and fully deserves our notice.

DOI: 10.5173/ceju.2013.02.art7

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