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ORIGINAL ARTICLE

A naked-eye comparison of image quality between a portable versus a fixed camera system for digital flexible ureterorenoscopy – A single centre experience

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Light source;
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ABBREVIATIONS

ENT, ear, nose and throat;
URS, ureterorenoscopy

Abstract ***Objective:*** To assess the image quality using the portable OTV-SI (Olympus, Southend, UK) light source system compared to a dedicated fixed standard stack system for flexible ureterorenoscopy (URS) as judged by the human eye.

Methods: We compared two differing flexible URS set-ups. The first was our normal completely digital fixed set-up, comprising a flexible ureteroscope and matching digital stack system (CLV-S40 PRO-6E, Olympus). The second set-up comprised the same digital ureteroscope but with a conventional non-digital stack system and the OTV-SI portable light source. Seven experienced urologists were asked to subjectively assess the quality of the video sequences with the naked eye. The image qualities assessed were as follows: colour, distortion, graininess, depth perception, contrast, and glare. Finally, they were asked to guess whether they were observing images from the normal fixed set-up or the portable set-up. Fisher's exact test was used to compare the two sets of nominal variables.

Results: There were no significant differences in the observation ratings between the fixed and portable systems, independent of observer or image settings. Also, the surgeons were not able to correctly guess which stack system had been used.

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Conclusion: For flexible URS imaging, the combination of a digital ureteroscope with a conventional non-digital stack system together with the OTV-SI portable light source was subjectively found not to be inferior to the completely digital fixed set-up. Thus, the cheaper and smaller portable system could be considered as an economical option without substantial loss of image quality, especially useful in developing countries.

Introduction

In recent decades technological advances have transformed stone surgery and resulted in the development of endourology as a subspecialty. We have in this short time relegated open stone surgery to a bookmark in history and currently we witness the ongoing rise of the flexible ureteroscope [1]. The boundaries of ureterorenoscopy (URS) are constantly expanding and being pushed further. Marshall [2] first described the use of a flexible ureteroscope in 1964, when a 9-F flexible ureteroscope was used to inspect the renal calyces. Further developments of flexible URS would wait another couple of decades however. In the early eighties, Bagley's group in Chicago further developed the flexible ureteroscope demonstrating active deflection, which greatly aided navigation of the tip to the point of interest, as opposed to the previous techniques relying on mere passive deflection [3].

Subsequently, we have seen the rapid development and application of flexible URS as a potent tool in the armamentarium of the endourologist. It has been successfully used in the treatment of intrarenal calculi with effective and safe treatment of ever larger stones conventionally managed with percutaneous nephrolithotomy. The advent of digital ureteroscopes has allowed for better visualisation, especially in the cases of transitional cell tumours of the ureter and kidney. This has facilitated successful topical management of these tumours in patients' unfit or declining radical treatment.

Despite the above, it would be far too simplistic to state that the digital flexible ureteroscope is an essential tool for the endourologist without considering its limitations. Firstly, there is the cost of the scope together with the additional costs of the specific stack system comprising camera, light source and image processing hardware [4]. Although the cost of the ureteroscope may not be disagreeable, the cost of the stack system however can be, and the prospective purchaser may be deterred by having to change their whole existing stack system when changing to digital. A possible cost-saving solution could be a portable system, i.e. the OTV-SI (Olympus, Southend, UK; Fig. 1). In the present study, we assessed the subjective image quality of this portable system compared to a dedicated fixed standard stack system for flexible URS.

Methods

The Olympus OTV-SI is a compact integrated camera control unit and light source that has been introduced for use in fibre optic endoscopy, with current users including ear, nose and throat (ENT) surgeons, anaesthetists, and gynaecologists. It is possible with this system to use a digital flexible ureteroscope together with an existing (analogue, non-digital) stack system. The OTV-SI can process and output the digital signal from the flexible ureteroscope to any conventional monitor.

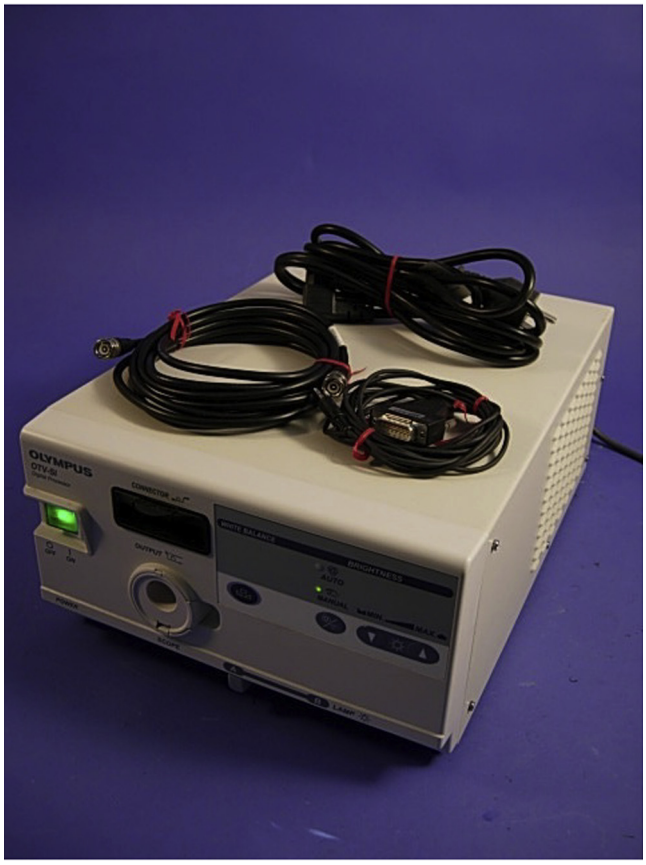

Fig. 1 The Olympus OTV-SI portable system.