

## Image J Analysis of intraoperative Contrast Enhancement with Fibreoptic Light source in open Urological Procedures

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**Abstract:** 40 patients underwent open urological surgeries including pelvic surgeries . A flexible Fibreoptic light source was used in addition to the conventional OT lights. Digital images before and after enhancement were taken in the same frame & field and were analysed .Image j analysis showed significant contrast enhancement in the surgical field of interest . Fibre optic light source enhances Vision ,clarity and brightness at the operating site. A focussed contrast enhancement is possible in deeper areas especially of the Pelvic surgeries with the flexible and manoeuvrable light source. The practice is simple, cost effective, easily available and enhances comfort level ,precision and ergonomics of the surgery.

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### I. Introduction

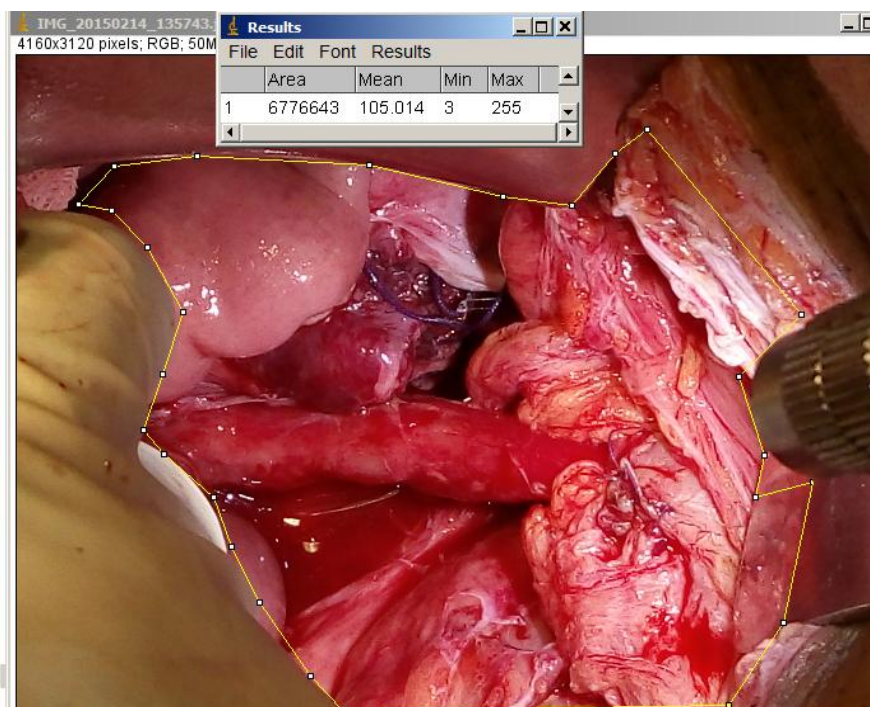
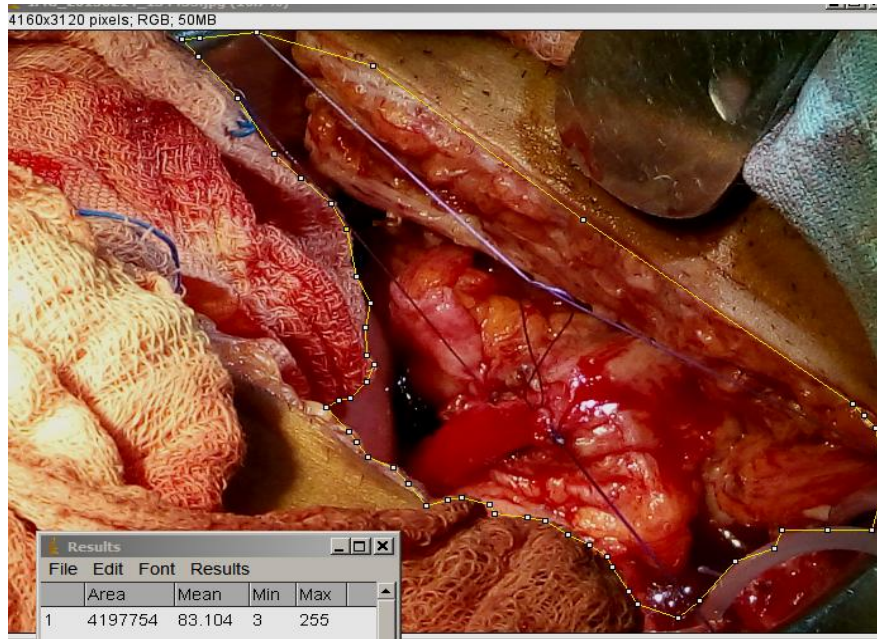
Open Urological surgeries vary a wide spectrum from simple circumcision to complex dicalcystoprostatectomy with varying duration. The availability of a good vision makes a huge difference at the operative site in terms of clarity of the intricate anatomy ,better dissection ,less strain and more comfort .This is indeed a prerequisite in case of pelvic surgeries involving bladder neck ,prostate and distal ureter. Even with advancements of OT lights from halogen bulbs to LEDs there are still blind spots and unfathomable regions in the surgical field which cannot be lightened however may the brightness and manoeuvrability of the conventional OT light .The fibre optic light source is nothing but insitu delivery of light with not just better intensity but with accessibility to deeper undulating crevices , tunnelled tissues and manoeuvrable to deep pedicles .Also real time adjustments can be made in the convoluted path independently unlike the head lights. In this study we have demonstrated the benefits of using Fibre optic light source.

### II. Methods

Intra-operative digital images were taken with the same camera, focus and settings in the same frame and operating field. After switching on the light source (Karl storz endoscopic LED light source ) held by assistant a second image was taken and was compared with previous image in the field of the interest. The optimal distance between the light source and the area focussed is adjusted as per surgeons preference thereby preventing undue brightness. Image J software were used for the measurement of contrast enhancement .Polygonal selection was used for delineation and encircling the region of interest (ROI) which was analysed .The mean contrast in the ROI was compared with the image without light source . SPSS 16 was used for statistical analysis and comparison of means by paired t test. The pictures were taken in open urological surgeries which included Ureteric reimplantation - 3 , Nephrectomy -12 , Pyeloplasty -10 ,Radical cystoprostatectomy - 2 bladder injury Repair -2 , Cystolithotomy - 6 ,open ureterolithotomy -4 Retroperitoneal surgeries-1 .

### III. Results

Image j analysis was done in 40 cases .The baseline contrast was found to be 88 SD 19 which increased to 108 SD 16 with fibre optic light source enhancement .The mean focussed contrast enhancement were estimated to be 26 percent which was significant  $p=0.01$ . All the surgeries were comfortable with this practice , improved the vision and were satisfactory .The Operating theatre lights were almost never adjusted during the surgical procedure when fibre optic light source were used .

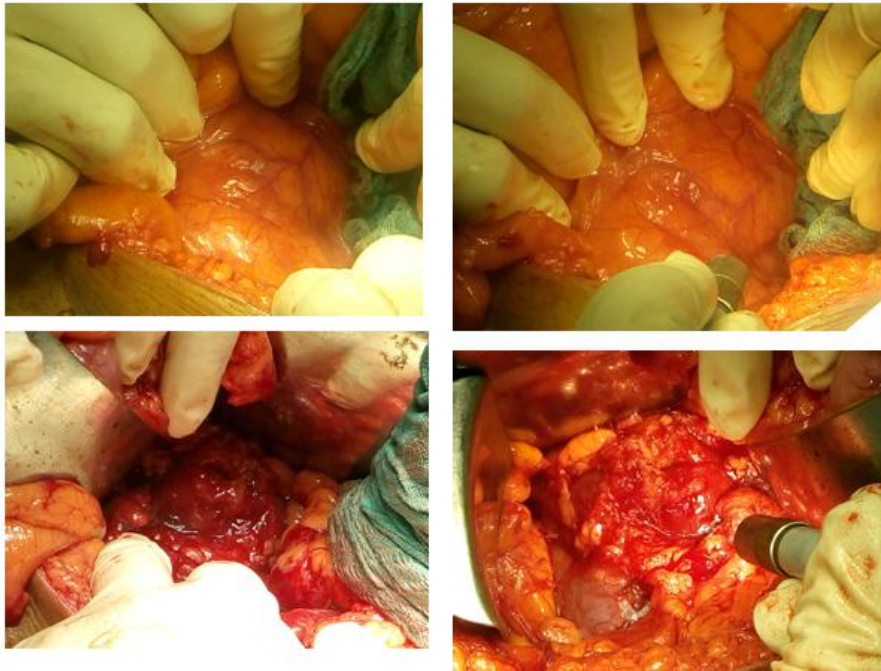


The images shown have mean brightness of 83 before and 105 after contrast enhancement. By subtracting we get 22 units of enhancement. In this case  $(105 - 83) / 83 = 22 / 83 = \text{Mean } 26.5$  percent is the focused contrast enhancement at optimal distance of light source.

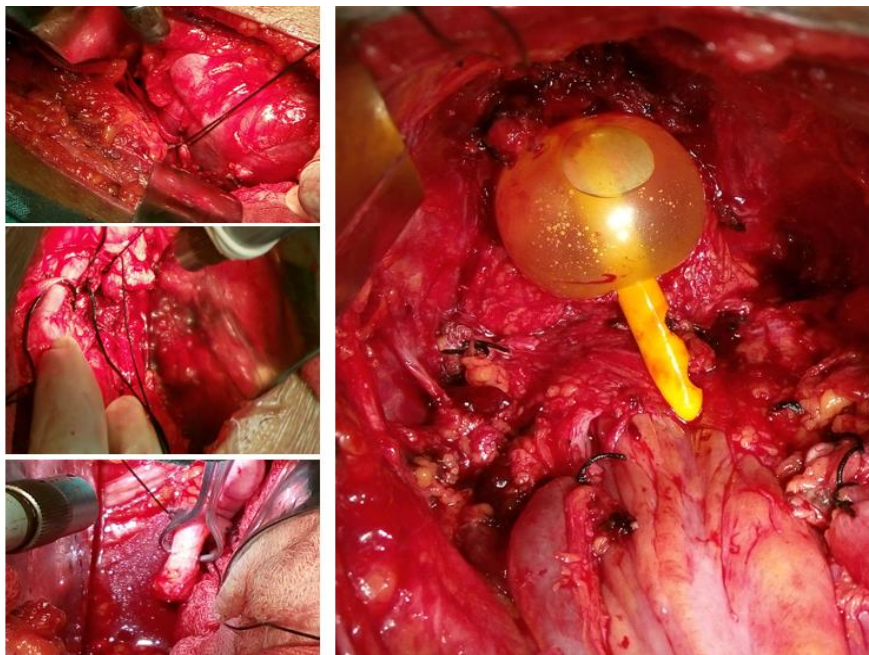
#### IV. Discussion

Definitely the presence of flexible light source improves the brightness and clarity of the operating field. In our study the distance how close the light source is kept to the ROI is adjusted according to the surgeon as and how the surgery advances. Ability to Manipulate the light source in different directions increases the degrees of freedom and also the contrast of the field & direction of the source can be optimised on moment to moment basis.

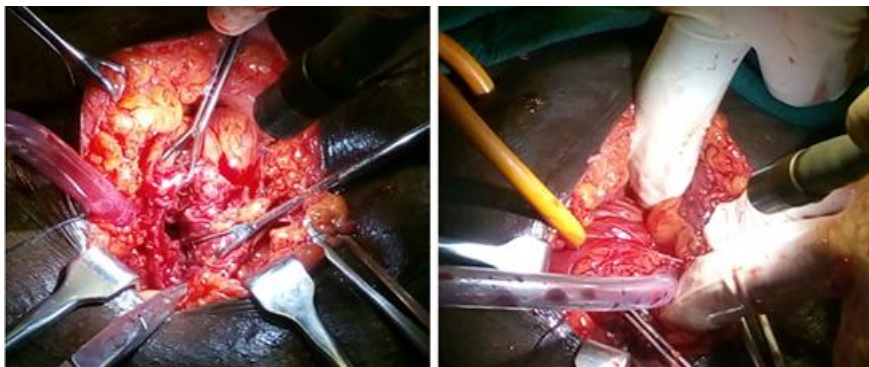


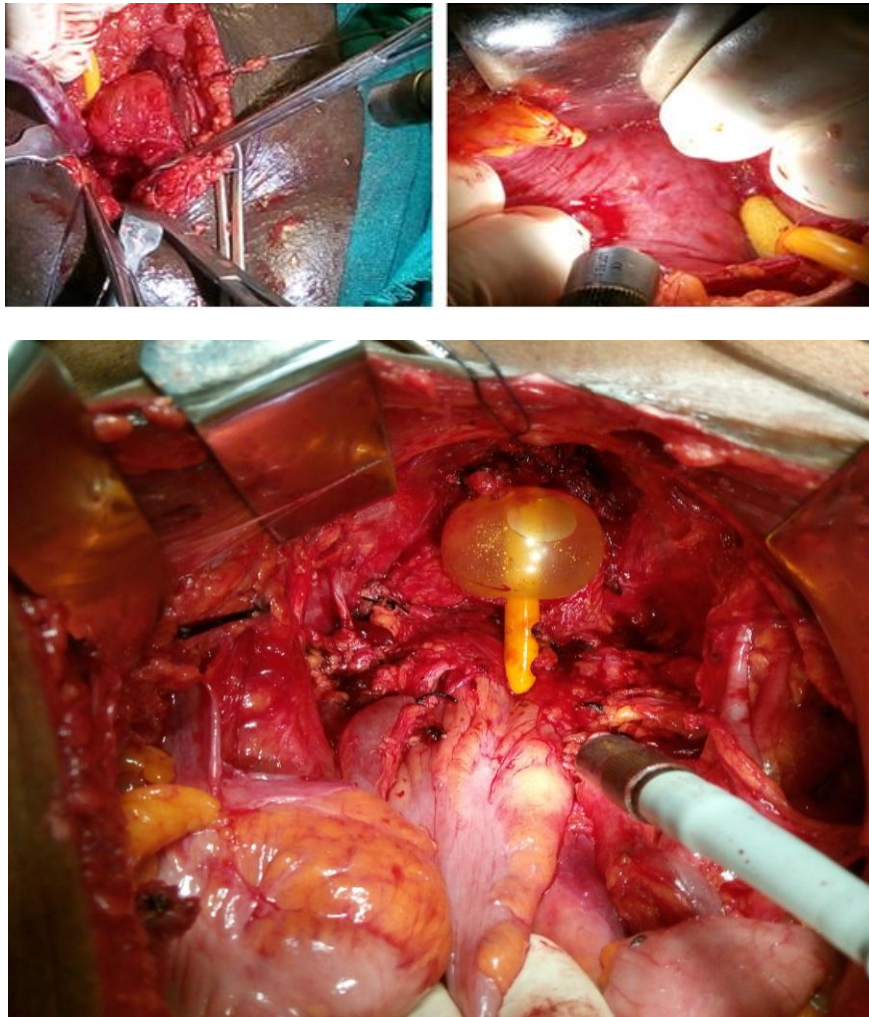


**Figure 1** Comparison with and without light source in the same field



**Figure 2** Light source used in Ureteric reimplantation ,Pedicle ligation in nephrectomy.





**Figure 3 :** Use of light source in various major Urological Procedures- Cystolithotomy, Radical systectomy,Radical cystoprostatectomy.

In Nephrectomies it helps in the hilar dissection in tackling the small veins and multiple renal arteries and ligation of the pedicles which lies deep and close to IVC. In Pyeloplasty it is helpful in delineating the vessel crossing and Ureteric dissection anastomosis. It is a must in Radical cystoprostatectomy, bladder neck surgeries and retroperitoneal surgeries since the visibility and availability of light is similar to the laparoscopy or robotics which avoids unnecessary struggle in the open surgeries. Simplicity, Maneuverability, flexibility, availability with no extra cost are the advantages and the results are Gratifying with impeccable vision. We recommend Fibre optic light source to be in the instrument trolley for all major open urological Procedures.

### **References**

- [1]. H S Ram, S Ram. Image J Analysis Of Amniotic Fluid Echogenicity And Labor. The Internet Journal of Gynecology and Obstetrics. 2013 Volume 17 Number 3.