ORIGINAL ARTICLE

UTILITY OF SMARTPHONE IN CAPTURING LAPAROSCOPIC CHOLECYSTECTOMY: A COST-EFFECTIVE TECHNIQUE

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ABSTRACT

Introduction: These days the use of multimedia recording is prevalent in healthcare systems. Surgical procedures are being recorded all over the world for coaching purpose and it also aid in assessing surgeons performance to improve patient care quality, sharing rare operative finding with colleagues so providing better way of communication among surgeons and above all, this act of video recording is also a stress reliever for the operating surgeon too by rewinding the video in order to search for any lost gauze piece during surgery to avoid medical negligence.

Material & Methods: This retrospective study was conducted at Government Tehsil Headquarter (THQ) Hospital Sabzazar, Lahore from May 2021 to September 2023. The study included 226 patients who underwent laparoscopic cholecystectomy. All laparoscopic cholecystectomies were captured by smartphone camera, mounted on a tripod stand. Time required for video recording apparatus setting was recorded. Additional equipment and staff needed for recording was noted. Utility in terms of video image quality, zoom capability, resolution and recorded videos sufficient for coaching purposes was assessed by independent respondent by using 5-point Likert scale.

Results: Time required for video recording apparatus setting was 3.62±1.01 minutes. 5-point Likert scale score of video image quality, zoom capability and resolution were 5, 5 and 5, respectively. Recorded videos sufficient for coaching purposes had a score of 4. No additional equipment and staff were needed for recording in the operating room. Overall utility of smartphone cameras in capturing laparoscopic cholecystectomy was 4.75.

Conclusion: A remarkable video of laparoscopic cholecystectomy can be captured by using smartphone camera which can later be availed for teaching and training purposes of medical students.

Keywords: Laparoscopic Cholecystectomy, Smartphone, Utility.

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INTRODUCTION

These days use of multimedia recording is prevalent in healthcare system.[1,2] Surgical

procedures are being recorded all over the world for coaching purpose and it also aid in assessing surgeons performance to improve patient care quality, sharing rare operative finding with colleagues so providing better way of communication among surgeons and above all, this act of video recording is also a stress reliever for the operating surgeon too by rewinding the video in order to search for any lost gauze piece during surgery to avoid medical negligence. [3-5]

In this era of technology, video recording of surgical procedures is as necessary as documenting operative details and publishing a medical textbook. [6-8] Pictures and videos, being self-explanatory, share procedural details among surgeons better than narrating operative stories. [9,10] Videos of endoscopic and laparoscopic surgeries are easy to record as compared to open surgery. However, video recording equipment is not available everywhere because of its high cost. To overcome this problem, smartphone camera mounted on tripod stand, as a low-cost tool, was utilized to record laparoscopic cholecystectomy in this study.

In a retrospective analysis, Nedelcu M[11] et al, utilized video recording to assess bariatric surgery complication. However, scarce data is available in literature on utility of smartphone cameras such as video recorders. In a study by Sheahan G[12] et al, overall utility of smartphone was reported 4. The aim of this study was to assess the utility of smartphones as low-cost video recording devices in capturing laparoscopic cholecystectomy in a limited facility medical setup.

MATERIAL AND METHODS

This retrospective study was conducted at Government THQ Hospital Sabzazar, Lahore from May 2021 to September 2023. This study included 226 patients of both genders, who underwent laparoscopic cholecystectomy for gall bladder pathology. Patients who didn't give consent for video recording of surgical procedures were excluded from the study. The study was approved by the Ethical Review committee as per institutional guidelines. All cholecystectomies were performed laparoscopically with four port techniques and 30^{O} telescopes by a single surgeon. The procedures were recorded on surgeon`s smartphone camera (android 8.0.0 version, 2160 x 1080 screen, 16MP Camera) as a part of routine clinical practice.

Smartphone was mounted on tripod stand (height 7 feet, adjustable) and stand was placed against laparoscopic trolley (Figure 1). In order to get good video content, the camera was adjusted parallel to TV monitor screen to include all four corners of monitor in view and positioned in a way that it didn't interrupt monitor sight to surgeon. Video recording started when telescope entered the abdominal cavity after intrabdominal gas inflation and stopped when telescope was taken out of abdominal cavity at the end of procedure. The whole video was recorded directly from the TV monitor and only surgical procedure was filmed. Neither operating room staff nor the patients were captured in video at any time during the surgery.

Time required for video recording apparatus setting was recorded. Utility in terms of video image quality, zoom capability, resolution and recorded videos sufficient for coaching purposes was assessed by independent respondent by using 5-point Likert scale (1-Worst; 2-Bad; 3-Average, 4- Good; 5- Best).

All the data collected was entered into SPSS version 22 and analyzed. Quantitative data like Time required for video recording apparatus setting, was presented as means and standard deviations. Mean, median, standard deviation, minimum and maximum were calculated for video imaging quality, zoom capability, resolution and recorded videos sufficient for coaching purposes. The qualitative data like the need for additional equipment and staff for recording in the operating room were presented as frequency and percentage.

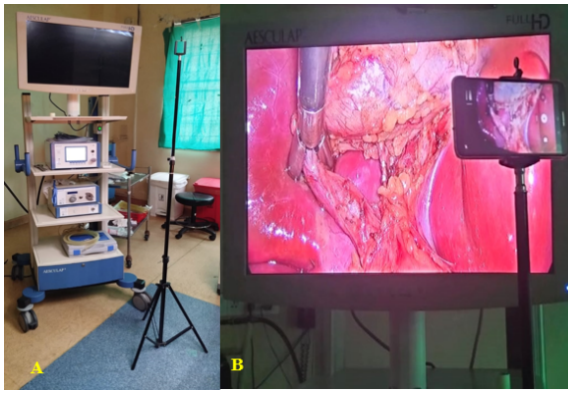

Figure 1: Tripod stand: A, stand positioned against laparoscopic trolly, B: Smartphone camera mounted on tripod stand

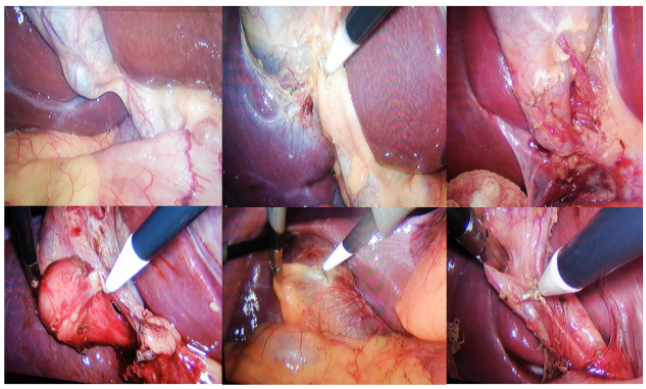

Figure 2: Quality of different images of smartphone camera

RESULTS

Mean age of patients was 47.37±6.06 years with male to female ratio of 1:8. Mean BMI was 32.02±3.10 Kg/m^2. No additional equipment i.e. 0(0.0%) and staff i.e. 0(0.0%) was required for recording in the operating room. Time required for video recording apparatus setting was 3.62±1.01 minutes. 5-point Likert scale score of video image quality, zoom capability and resolution were 5, 5 and 5, respectively. Recorded videos sufficient for coaching purposes had a score of 4. No additional equipment and staff were needed for recording in the operating room. Overall utility of smartphone cameras in capturing laparoscopic cholecystectomy was 4.75. Utility of smartphone in laparoscopic cholecystectomy is shown in Table I.

Table I: Utility of Smartphone in Laparoscopic Cholecystectomy (n=226)

Parameters		Score
Time required for video recording apparatus setting (min.)		3.62±1.01
Utility of smartphone	Video image quality	5
	Zoom capability	5
	Resolution	5
	Recorded videos sufficient for coaching purpose	4
	Overall utility	4.75

DISCUSSION

In the modern era of technology, old ways of communication e.g. emails, text messages and phone calls are less helpful in narrating the operative difficulty. These days, pictures and videos are common to share for effective communication, as they share every detail of the story. WhatsApp and social media inventions have provided platforms where pictures and videos are being shared easily for information purposes. Videos are helpful in educating trainees and patients as well. Many patients, these days, come up with YouTube videos of procedures of their surgery. In a low budget medical setup, where recording device for laparoscopic cholecystectomy is not available, we utilized surgeon`s smartphone camera for this purpose, recorded 226 laparoscopic cholecystectomies and reported its feasibility in the present study. Being the most common procedure in almost every surgical OR laparoscopic cholecystectomy procedure was chosen to be recorded.

Video Recorder for laparoscopy is usually not available in every hospital setup. Smartphone cameras can be utilized for the same purpose. In the present study, time required for video recording apparatus setting was practical. Meanwhile patients were being painted and draped, the camera could be adjusted easily.

In a study by Sheahan G[12] et al, reported video image quality, zoom capability and resolution were found good. However, in our study, video image quality, zoom capability and resolution were reported the best. In contrast to Sheahan G[12] et al study, overall utility of smartphone in our study was

reported good i.e. 4.75. These days smartphone cameras are part and parcel of daily routine and most of the phones are equipped with good quality cameras. So, video image quality, zoom capability and resolution were scored high in our study. The recorded videos were sufficient for coaching purposes and scored 4 because of linear parallax, due to position of camera at one end of TV monitor. In our study, we stored data in 2TB (2 terabytes) hard drive which was an additional cost.

Single center, single surgeon and small sample size are the limitations of this study.

CONCLUSION

Application of smartphone camera along with a tripod stand, to capture laparoscopic cholecystectomy, is cost effective as compared to any available video recorder system for laparoscopy. However, enough digital data storage space is required to store videos.

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