

ROLE OF 3 D VIDEO TECHNOLOGY IN PLASTIC SURGERY

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ABSTRACT

Photographic documentation and videography is commonly used technology in plastic surgery. Conventionally, 2 D videography is used to record various procedures for documentation and training. In the modern era of digital technology, 3 D has come into practice. The 3 D technology has various advantages over 2 D technology. This study highlights the role of 3 D video technology in plastic surgery and review of the literature.

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INTRODUCTION

A three-dimensional video (also known as three-dimensional film, 3D film or S3D film) is a motion picture that enhances the illusion of depth

perception, hence adding a third dimension. The most common approach to the production of the 3D video is derived from stereoscopic photography. In this approach, a regular video camera system is used to record the images as seen

from two perspectives and special projection hardware or eyewear is used to limit the visibility of each image to the viewer's left or right eye only. 3D videos are not limited to theatrical releases; these days 3 D videos can be recorded with commercially available 3 D video cameras and projected on compatible screens.¹ On review of the literature, it is found that very few studies have been conducted on the role of 3 D video technology in plastic surgery. The reason behind its less usage, maybe, due to the cost factor, non-availability of experts and equipment but when it comes to the outcome, it is found that certainly 3 D technology has better perception and understanding to the viewer than the conventional 2 D technology. 3 D technology has already been in practice till other branches of medicine like the use of 3 D technology in ultrasonography, Computerised tomography (CT), laparoscopy etc. The application of 3 D in videography started somewhere in the 1900s, whereas its application in plastic surgery is of recent origin. Photographic documentation and videography are commonly used technology in plastic surgery.² Conventionally, 2 D videography is used to record various procedures for documentation and training. In the modern era of digital technology, 3 D has come into practice. The 3 D technology has various advantages over 2 D technology. This study highlights the role of 3 D video technology in plastic surgery and review of the literature.

Methods

This is a retrospective observational study analyzing the role of 3D videography in plastic surgery conducted in a tertiary care hospital over a month from January 15, 2019, to February 15, 2019. Informed written consent was taken from the subject undergoing surgeries and agreed to record their surgeries. Total of eighteen 3D videos (surgeries) over a period of one month was recorded using a 3D video camera (figure 1,2), viewed on a 3 D compatible screen (Figure 3) and were shown to 10 plastic surgeons (figure 4). Their views were recorded in the feedback proforma (figure 5). Following are the specifications of the 3D video camera used in the study:

- Image Sensor: 1/3.2- inch 5 M CMOS Sensor x2
- Storage Media – Internal – 128 MB Flash Memory
- External – SD card (Upto SDHC 32 GB)
- Sensitivity – Auto
- Lens – F 3.2, f = 5.1 mm
- Movie – File Format H264 (AVI)
- Resolution
- 3D Movie: WVGA 648x480 60fps, 720p 30/60fps, 1080p 30fps
- 2D Movie: WVGA 648x480 60fps, 720p 30/60fps, 1080p 30fps
- Still Image: File Format: JPEG
- Zoom : 3 D 8x
 - 2D : 10x

- LCD monitor: 3.2 Inch color LCD (320x480 pixels)
- Focus Range : 1.2 m to infinity
- Exposure : Programmed AE
- LED light - Effective Range <1 m
- Mode On/ Off
- White Balance: Auto/ Sunny/ Tungsten/ Flourescent
- EV compensation: -2.0 EV to +2.0 EV
- Shutter Speed : Video – 1/15 to 1/2000 second Still – 2 to 1/4000 second
- Interface AV- out – NTSC/PAL/HDMI
MSDC: USB 2.0 High speed
- Power Supply – Li-ion battery NP120
- Dimensions – Approx 43 (W) x 68(H) x 135 (D) mm

Weight: Approx 232 m (excluding batteries and memory card)

The specifications of the screen used to view the videos are as follows:

- TV Type : 3D TV
- Screen Size : 40 inch
- Screen Resolution 1920 x 1080
- Aspect Ratio 16:9
- Motion rate 500 Hz
- Picture Engine : 3 D HyperReal Engine
- Dynamic Contrast Ratio : 1000000: 1
- Wide Color Enhancer : Yes
- Micro Dimming : Yes
- Auto Motion Plus 120 Hz
- SRS: DTS Studio sound
- Sound output 10 watts x 2

- 3 D Converter : Yes

Specifications of 3D glasses to view recorded 3D video surgeries are as follows:

Optics : Shutters : Liquid Crystal

Recommended operating distance : 2-6 m

Field rate : 120 fields/ second

Transmittance 36+/- 2%

Weight : Glasses : 21.5g

Power Glasses : one 3V Lithium/ manganese dioxide battery 3V

Power Consumption : Glasses : 0.85 mA (Average)

The feedback was taken in a feedback proforma (questionnaire based). No comparison with 2D videos was done. No statistical analysis was done.



Figure 1: 3D Video Camera and 3D goggles used for Recording



Figure 2: 3D Video being recorded by the OT attendant



Figure 3: 3D compatible screen used to view the surgical videos



Figure 4: 3D Video being viewed by surgeon

QUESTIONNAIRE
FEEDBACK FORM

Topic : "Role Of 3 D Video Technology in Plastic Surgery"

1. Date :
2. Place :
- Local : JIPMER, Pondicherry
- Remote : (Name of Your Medical College)

1. Outcome

7.1. Overall quality of the video : Poor/ Average / Good
7.2. Audio clarity of the video : Poor/ Average / Good
7.3. Video clarity of the video : Poor/ Average / Good
7.4. Depth perception in the video : Poor/ Average / Good
7.5. Would you like to recommend your friend and also attend yourself similar Session in future

2. Suggestions/Remarks:

Contact details:

Name of the Participant :
Email Address :
Mobile/ Landline No :
Name of Medical College :
Email Address :
Mobile/ Landline No :

Figure 5: Feedback Proforma

Results

On analyzing the feedback proformas it was found that viewers were satisfied with audio, video clarity, depth of perception and recommended for peers to adopt the use of 3D video technology for recording.

Discussion

Accurate description of the surgical technique and individual variation depending on the patient’s clinical status are difficult to give in writing even when photographs and figures are included. Video documentation of the surgical videos as

educational tools are essential as the images are clear, videos are in proper sequence, explained out by an operator, and zoom allows a detailed recording of the important surgical procedures. The application of an extra dimension to the video in case of three-dimensional videos gives an added novelty and clarity to the video. Accurate geometry acquisition of moving objects is required in a wide variety of applications ranging from marker-less motion capture to three-dimensional face recognition. Despite the availability of numerous acquisition and reconstruction methods, achieving high spatial resolution at video rates with a low-cost system is still a challenging problem.³ This is the reason, perhaps, why the recording of surgical videos is common but the recording of 3 D surgical videos is still not practiced. The commercially available 3 D Video camera price varies from 200 to 500 USD. Though the surgeon's head-mounted camera is better equipped to give the surgeon point of view these handheld 3 D cameras are much cheaper. ⁴

The limitation of the study is that the comparison to the conventional 2 D camera for an understanding of the video has not been done through the experience of all subjects with the 3D video was extremely satisfactory. Another limitation is that 3 D video needs specific equipment in the form of compatible screens and 3 D glasses which are expensive.

Conclusion:

The application of 3D videography adds an added depth perception and helps in better understanding of surgical videos. The cost of the required equipment and infrastructure may be a limiting criterion.

Conflict of Interest Statement-

There is no conflict of interest.

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