

## Educational Forum

# Hepato-pancreatico-biliary surgical education: rediscovery of cadaver based teaching

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### ABSTRACT

**Background:** As the classical surgical training (mentor–trainee) model is not feasible in the current era of surgical training and simulation model for training young residents is proven, the advanced surgical residents may benefit from cadaver based surgical teaching.

**Methods:** International Hepato-Pancreato-Biliary Association India 2017 provided great opportunity to organize basic hepato-pancreatico-biliary (HPB) anatomy workshop clubbed with HPB radiology and other advanced surgical techniques. It was attended by advanced surgical residents and practicing junior faculty. Post-program survey was conducted and results implied.

**Results:** 131 surgeons attended and 90 (80% residents, 15.6% practicing surgeons) completed the survey. Majority (97.5%) felt that the HPB anatomy was adequately demonstrated by spending enough time for dissection techniques and discussion. Most (84.7%) never attended cadaveric dissection during or after their training program. 95.1% think that dedicated anatomy or dissection teaching sessions are either very useful or useful for their level of surgical training. All participants found cadaveric workshop either very useful (73.3%) or useful (26.7%) learning tool. Majority (73.3%) felt that demonstrated HPB procedures were appropriate for their level. All participants (100%) felt that cadaveric workshops will improve their surgical skills and many (93.4%) felt these improve their confidence in operation theatres.

**Conclusions:** This cadaver based HPB teaching program is an initial step for unique HPB surgical education and useful adjunct for advanced surgical trainees in modern era. Residents consider this as good learning tool and possibly improve surgical skills and confidence. The translation of cadaver based HPB surgical learning into better surgical care needs evaluation in future.

**Keywords:** HPB Surgery, Education, Cadaver training

### INTRODUCTION

Surgical training is a multi-faceted cognitive learning experience which includes the assimilation of knowledge, development of surgical judgment and ability to master technical skills.<sup>1</sup> We assume that the surgical training includes learning basics of surgical principles, surgical anatomy, and techniques; and these are learnt through

observing the master teachers operate during their training programs.

The classical surgical training (mentor – trainee) model is not feasible in the current era. And now, surgical education is going through multiple glitches such as decreased resident independence, increasing patient demands, emphasis on reduction of medical errors, and

pressure for the speed of the surgery and enforced restricted work-hours such as 80 hours in USA, 48 hours in UK and 40 hours in Europe. Many new ideas have been generated and tested to overcome the above obstacles. Though surgical education has accepted the simulation model for training young residents, the advanced surgical residents may be beneficial with cadaver based surgical teaching. Though live surgery streaming at the conference workshop has been prevalent for quite long time, it has its own disadvantages such as the unfamiliarity of operating surgeon, expensive, ethical issues, shouldering of responsibility, etc.<sup>2</sup>

Among the sub specialties of general surgery, hepatopancreatico-biliary (HPB) surgery is considered as one of the tough subjects owing to complex anatomy, paucity of HPB procedures and the pricey errors. We hereby describe our initial attempts to orient the residents or post-graduates towards the HPB anatomy with the help of available cadavers and the assistance of live streaming technology. The aim of this study is to evaluate the role of basic HPB teaching including anatomy, radiology and advanced surgical skills for surgical residents.

## METHODS

IHPBA INDIA 2017, the annual conference of the Indian Chapter of International Hepato-Pancreato-Biliary Association (IHPBA), was held from January 27<sup>th</sup> to 29<sup>th</sup> 2017. This opportunity was utilized to organize the first of its kind and for the first time in IHPBA, the preconference post-graduate or resident teaching program on 26<sup>th</sup> Jan 2017. Many residents across the entire India have registered for this conference and hence this program is expected to benefit many budding HPB surgeons.

This program was planned to focus on the basics of HPB surgery which include the HPB anatomy, basic principles and techniques of dissection and anastomosis, and HPB radiology. The morning session was dedicated to basic HPB anatomy and surgical dissection techniques. Three fresh unclaimed cadavers were acquired from the forensic department for this purpose. Audio visual arrangements were installed in the mortuary and conference room to facilitate the live streaming of the anatomy and dissection by video and communication between the dissecting surgeons and the students and moderators in the conference room by audio. Two professional camera men from two different angles, who are well experienced in surgical live streaming captured the image on the direction of the dissecting surgeons. Two professors, one from UK and other from India demonstrated the HPB anatomy dissection and HPB surgical principles. Few eminent surgical teachers along with students were at the conference hall and interacted with the professors.

In the morning session, professor 1 demonstrated pancreas anatomy, various approaches, and pancreatic resection procedures such as Whipple's procedure, distal

and central pancreatectomy. Professor 2 demonstrated liver and biliary anatomy, liver mobilization techniques including the caudate lobe and liver resection procedures. The doubts and queries raised by the students were answered along with adequate demonstration on the cadaver (Figure 1).



**Figure 1: Demonstration from cadaver lab.**

The afternoon session started with the radiology sessions where computed tomography (CT), magnetic resonance imaging (MRI) and positron emission tomography CT (PET-CT) pertaining to HPB anatomy and pathology were detailed by three radiologists. This session is followed by video demonstration of vascular anastomoses techniques by a transplant surgeon, where he demonstrated the basic principles, tips and tricks regarding the arterial and venous anastomoses. Then biliary anastomosis was demonstrated by the professor 1 in which he discussed the basics of the biliary anastomosis.

## RESULTS

A survey was conducted at the end of the session and the results are a total of 131 doctors attended this HPB teaching program. Of them, 90 participants completed the post program survey. A total of 14 (15.6%) were practicing surgeons, 46 (51.1%) were surgical gastroenterology residents, 12 (13.3%) were surgical oncology residents and 14 (15.6%) were general surgery residents and rest non-responders about their position (Figure 2). The audio-visual aids were appropriately arranged, clearly audible and visible (95.6%). All the participants (100%) reviewed that the programs matched their expectations. Majority (97.5%) felt that the HPB anatomy was adequately demonstrated by spending enough time for dissection techniques and discussion. Most participants (84.7%) have never attended cadaveric dissection during or after their post-graduate or residency training program. Since the completion of medical school or college, 88.9% either never had or only had limited anatomy or dissection teaching; and 6.7% had sufficient anatomy teaching and 4.4% had extensive anatomy teaching (Figure 3). 95.1% think that dedicated anatomy or dissection teaching sessions are either very useful or

useful for their level of surgical training (Figure 4). All the participants found the cadaveric workshop either very useful (73.3%) or useful (26.7%) learning tool. Majority of the participants (73.3%) felt that the demonstrated HPB procedures were appropriate for their level. All the participants (100%) felt that the cadaveric workshops such as this will help improve their surgical skills. Also, many participants (93.4%) felt that the cadaveric workshops are useful in improving their confidence in the operation theatres (Figure 2). Many participants (91.1%) felt that the HPB radiology session is apt and they think it is either very useful (31.1%) or useful (60%) in their daily practice. The demonstration of vascular anastomoses techniques and tips were felt to be either useful (53.3%) or very useful (26.7%) in their practice.

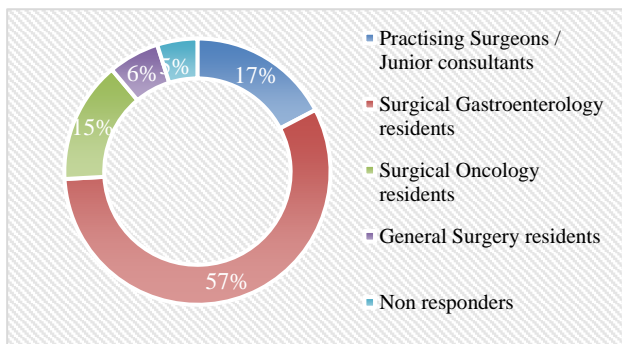


Figure 2: Participants in the program.

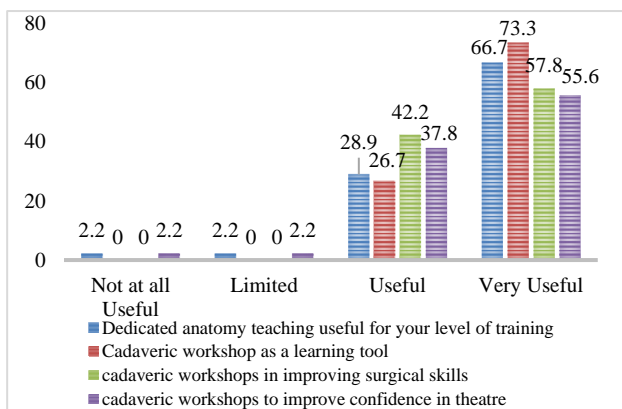


Figure 3: Usefulness of HPB surgical education program.

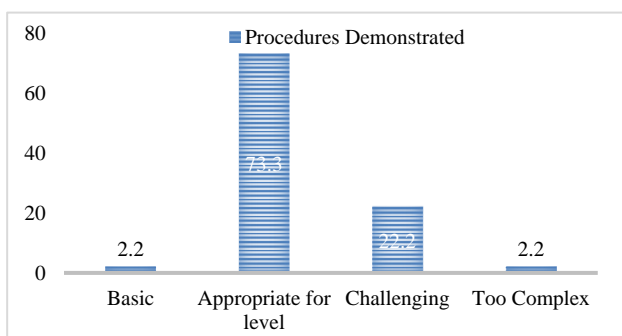


Figure 4: Level of procedures demonstrated.

## DISCUSSION

This cadaver based HPB teaching program seemed to be an initial step for unique HPB surgical education. In the modern era of surgical training, cadaveric workshops appear to be useful adjuncts for advanced surgical trainees. Though cadaver based surgical education is not popular, especially in HPB surgery, residents consider these programs as good learning tool and possibly improve surgical skills and confidence. The preconference PG or resident teaching program aimed at educating the residents was successful. It achieved its target by filling the lacunae among the residents.

Many centers have explored the human cadaver as training model. The cadavers have been utilized to teach anatomy to surgical residents.<sup>3-5</sup> Performing procedures such as laparoscopic procedure, endovascular procedures demand specific capabilities which can be best achieved by only hands on training.<sup>4,6</sup> The hands on training on the cadaver, except the factual bleeding; with the same operative equipment is unique and invaluable. However, there are quite a few disadvantages such as cadaver can be used only by one or two residents of same specialty and to set up and maintain an exclusive cadaver lab is costly.<sup>4,6</sup>

Our program was planned to orient the advanced surgical residents about the complex HPB anatomy, approaches, tips and tricks of tackling the obstacles, variations and complications. We believed that the advanced surgical residents would have acquired and mastered the basic surgical skills; thus, their requirement would be to understand the spatial HPB anatomy, and correlation with HPB radiology. Regardless, an animal skill lab was setup during the regular conference hours where the residents benefitted from hands on training to practice anastomotic techniques.<sup>7</sup>

Simulation, as followed from pilot training has taken a front seat in surgical training. Apart from cadaver based simulation, other modalities include synthetic simulation model, animal models and virtual reality.<sup>8</sup> Though synthetic models are cheap and easy to manufacture, these models are best for basic surgical skill training, but will be hard to replicate the complex HPB anatomy. Though live animal models are superior to synthetic models, be realistic with blood vessels, blood and dissection planes; the anatomy will be not mimic human anatomy, pathology could not be instituted, associated with ethical issues, animal welfare laws, high cost and special facilities. It is ideal to practice, rather learn major vascular dissection and hemostasis.<sup>6,9-12</sup> Virtual reality can be both haptic and non-haptic. The well designed haptic virtual reality models will be the ideal and best simulator of the future. Virtual reality models are already available for various endoscopies (upper GI endoscopy, bronchoscopy, colonoscopy), endovascular procedures and laparoscopic procedures.<sup>9,13</sup> It is not impossible to reconstruct every patient with their CT and MRCP

images and embed into the virtual reality model.<sup>14</sup> In future, this provides the surgeon option of practicing the surgery of that particular patient in virtual reality, even before he actually performs the surgery.<sup>15</sup>

Though planned as appropriately structured for the target audience, there were some hitches such as pictorial comparison in the conference room pertaining to the demonstrated procedure would have enhanced the learning capabilities. The audience were only broadly informed about the procedures, wherein a micro structured program would have benefitted the students to come prepared. The ideal program will be a one-on-one mentor trainee on one cadaver, not that it's practically impossible; it will be expensive with inadequate resources. Nevertheless, this is an initial step towards the unique HPB surgical education program. The translation of these kind of based HPB surgical learning into better surgical care needs to be evaluated in the future.

The masters have hinted towards working a structured program for the benefit of residents in India as well as across the borders. The next steps for this program will be the use of 3D cameras which will benefit the residents by providing the appropriate visual-spatial awareness. As the feasibility of cadaver-based teaching programs has been tested and proven with our program, this can be applied to other surgical branches also. These kinds of programs are small steps towards training of the best surgeons and targeting zero errors.

## CONCLUSION

This cadaver based HPB teaching program seemed to be an initial step for unique HPB surgical education. Cadaveric workshops appear to be useful adjuncts for advanced surgical trainees in this modern era. Residents consider these programs as good learning tool and possibly improve surgical skills and confidence. The translation of cadaver based HPB surgical learning into better surgical care needs to be evaluated in the future.

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