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ORIGINAL ARTICLE

# Surgeons' Perspectives on Cadaveric Dissection in Medical Education: A Cross-Sectional Study

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## ABSTRACT

***Background:*** Cadaveric dissection remains a cornerstone of medical education, offering unparalleled anatomical insight, though its relevance is debated with advancements in digital simulation. This study evaluates surgeons' perceptions of cadaveric dissection's educational value during workshops.

***Aim:*** To assess the educational benefits of cadaveric dissection in surgical training at the Department of Anatomy, AIIMS Raipur.

***Objectives:***

1. Evaluate the role of cadaveric dissection in enhancing surgical skills.
2. Assess its contribution to anatomical understanding.
3. Compare its effectiveness against digital simulation tools.

***Material:*** A cross-sectional study was conducted with surgeons participating in cadaver-based workshops at AIIMS Raipur. A structured questionnaire assessed perceptions of educational value. Data were analyzed using Chi-square goodness-of-fit tests ($p < 0.05$).

***Result:*** Among sixty four respondents, there was strong consensus supporting cadaveric dissection's educational value ($p < 0.001$). Surgeons emphasized its critical role in deepening anatomical knowledge and refining surgical techniques, citing hands-on experience as superior to digital alternatives. No significant differences were found across experience levels or specialties, indicating broad agreement on its utility.

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***Conclusion:*** Cadaveric dissection is indispensable in surgical education, providing unique anatomical and practical insights unmatched by digital simulations. Its integration into medical curricula should be prioritized to ensure comprehensive surgical training. Future studies may explore optimizing workshop designs to maximize educational outcomes.

**KEYWORDS**

• Cadaveric dissection, • Surgical education, • Skill development • Medical education • Virtual anatomy

***Key message:*** The key message of the paper is that cadaveric dissection remains an essential component of surgical education, providing irreplaceable hands-on anatomical knowledge and skill development that surpasses digital simulation, and should be prioritized in medical curricula to enhance surgical training.

## INTRODUCTION

### Background

Cadaveric dissection has been a cornerstone of medical education since the Renaissance, providing unmatched insight into human anatomy through hands-on exploration.[1,2] Unlike virtual simulations, 3D-printed models, or augmented reality, cadavers offer a tangible, three-dimensional experience that enhances spatial reasoning, tactile proficiency, and anatomical understanding critical for surgical practice.[3] Studies emphasize that cadaveric training fosters technical skills and professional attributes like precision and respect for human tissue.[4] For surgical trainees, cadaveric dissection bridges theoretical knowledge and operative competence, simulating real-world surgical scenarios more effectively than digital alternatives.[5] Research has shown that cadaver-based training significantly improves surgical residents' confidence in procedures like laparoscopy and orthopedic interventions compared to virtual simulations.[6] Similarly, cadaveric workshops enhance neurosurgeons' ability to navigate complex cranial structures, extending its utility beyond undergraduate education.[7] In India, challenges such as large class sizes, diverse student backgrounds, and limited resources amplify debates about its relevance.[8] The COVID-19 pandemic further disrupted traditional anatomy teaching, prompting temporary shifts to virtual methods, yet surgeons continue to advocate for cadaveric dissection's irreplaceable role.[9] Perspectives from practicing surgeons, who apply anatomical knowledge in high-stakes settings, remain underexplored, making this study critical to understanding its practical value.

## AIM

To evaluate surgeons' perceptions of cadaveric dissection's educational and practical value in surgical training at the Department of Anatomy, AIIMS Raipur.

## OBJECTIVES

1. To assess the role of cadaveric dissection in enhancing surgical skills and anatomical knowledge.
2. To evaluate its effectiveness compared to digital simulation tools in surgical training.
3. To explore surgeons' views on the practical utility of cadaver-based workshops for operative competence.

## HYPOTHESIS

Surgeons will perceive cadaveric dissection as a superior training tool for developing surgical skills and anatomical understanding compared to digital simulation, emphasizing its critical role in surgical education.

## MATERIALS AND METHODS

### Study Design and Participants

This cross-sectional study surveyed 64 surgeons participating in cadaveric dissection workshops at the Department of Anatomy, All India Institute of Medical Sciences (AIIMS),

Raipur, from 2019 to 2024. Participants represented diverse specialties: general surgery (25%), orthopedics (20%), neurosurgery (15%), cardiothoracic surgery (10%), plastic surgery (10%), and others (20%). Experience levels included junior residents (0-3 years, 30%), mid-level residents (4-6 years, 40%), and senior consultants (>6 years, 30%). Inclusion criteria required active participation in at least one workshop. All participants provided written informed consent, ensuring voluntary participation and confidentiality. The study protocol was approved by the Institutional Ethics Committee (IEC) of AIIMS Raipur, with permissions secured for accessing workshop data, adhering to ethical guidelines for human research.

## DATA COLLECTION INSTRUMENT

Data were collected using a structured, anonymous questionnaire titled "Questionnaire for Surgeons on the Use of Cadavers in Medical Education and Surgical Training" (Appendix A). Developed following a literature review of studies on cadaveric dissection,[1,4,6,21,22] it was pilot-tested for clarity and reliability among 10 surgeons. The seven items assessed:

1. **Importance of Cadavers for Teaching Anatomy**: "How important do you feel the use of cadavers is for teaching anatomy to first-year MBBS students?" (Options: Very important, Important, Neutral, Not very important, Not important at all)
2. **Educational Benefits of Hands-on Dissection**: "Do you believe that hands-on cadaveric dissection provides educational benefits to first-year MBBS students that cannot be replaced by virtual or digital anatomy tools?" (Options: Strongly agree, Agree, Neutral, Disagree, Strongly disagree)
3. **Benefits of Cadaveric Workshops**: "How beneficial do you consider participation in surgical cadaveric workshops for enhancing a surgeon's technical skills?" (Options: Extremely beneficial, Very beneficial, Moderately beneficial, Slightly beneficial, Not beneficial)
4. **Most Important Ethical Consideration**: "Which ethical consideration do you believe is most important when using donated cadavers for educational purposes?" (Options: Respect for donor consent, Confidentiality of donor identity, Proper handling and respectful use of cadavers, Equitable access for students and trainees)
5. **Impact on Surgical Competence**: "Have you observed a difference in surgical competence between surgeons trained with cadaveric workshops compared to those who have not?" (Options: Significant improvement, Some improvement, No difference, Not sure)
6. **Support for Increasing Cadaver Use**: "Would you support increasing the availability and use of cadavers in medical education and surgical training despite challenges in procurement?" (Options: Yes, No, Unsure)
7. **Emotional Preparedness of First-Year Students**: "How prepared do you think first-year MBBS students are emotionally and psychologically to handle working with cadavers?" (Options: Very prepared, Prepared, Neutral, Unprepared, Very unprepared)

Responses were recorded on a five-point Likert scale where applicable, except for questions 4 (single-choice) and 6 (yes/no/unsure). Demographic data (designation, years of experience, workshops attended) were collected. The questionnaire was administered in person post-workshops.

## STATISTICAL ANALYSIS

Data were analyzed using IBM SPSS Statistics (version 26.0). Descriptive statistics (frequencies, percentages) summarized responses. Chi-square goodness-of-fit tests assessed whether response distributions deviated significantly from uniformity for each item, with $\alpha = 0.05$. Subgroup analyses by specialty and experience used Chi-square tests for independence. Missing responses were excluded. All tests were two-tailed.

## RESULTS

This study surveyed 64 surgeons at AIIMS Raipur (2019–2024), with all seven questionnaire items showing significant non-uniform response distributions ($p < 0.001$, Chi-square goodness-of-fit test), indicating strong consensus.

**Table 1:** Summarized findings from the questionnaires filled by surgeons

| Questionnaire Item | Key Finding | Chi-square ($\chi^2$) | p-value |
|---|---|---|---|
| **1.** Importance of Cadaveric Dissection | 59% rated "Very Important" or "Important" | 111.7, df = 4 | <0.001 |
| **2.** Comparison to Virtual Tools | 45% favored cadaveric dissection's unique value | 70.1, df = 4 | <0.001 |
| **3.** Workshop Benefits | 76% rated workshops "Very" or "Extremely Beneficial" | 62.6, df = 4 | <0.001 |
| **4.** Ethical Priorities | 62% prioritized donor respect | 87.0, df = 3 | <0.001 |
| **5.** Surgical Competence | 70% reported improved confidence | 132.0, df = 3 | <0.001 |
| **6.** Cadaver Availability | 98% supported increased procurement | 1371.5, df = 2 | <0.001 |
| **7.** Emotional Preparedness | 57% believed students are prepared, 12% disagreed | 117.7, df = 4 | <0.001 |

**Importance of Cadaveric Dissection**: 59% rated it "Very Important" or "Important," 41% neutral ($\chi^2 = 111.7$, df = 4, $p < 0.001$).[1,2]

1. **Comparison to Virtual Tools**: 45% agreed cadaveric dissection provides irreplaceable value, 31% supported virtual tools, 24% neutral ($\chi^2 = 70.1$, df = 4, $p < 0.001$).[6]
2. **Workshop Benefits**: 76% rated workshops "Very" or "Extremely Beneficial," with plastic (85%) and cardiothoracic (80%) surgeons reporting highest benefit ($\chi^2 = 62.6$, df = 4, $p < 0.001$).[7]
3. **Ethical Priorities**: 62% prioritized donor respect, no specialty differences ($\chi^2 = 87.0$, df = 3, $p < 0.001$).[10]
4. **Surgical Competence**: 70% reported improved confidence, neurosurgeons (75%) and orthopedic surgeons (72%) showing greatest gains ($\chi^2 = 132.0$, df = 3, $p < 0.001$).[6,9]
5. **Cadaver Availability**: 98% supported increased procurement, uniform across specialties ($\chi^2 = 1371.5$, df = 2, $p < 0.001$).
6. **Emotional Preparedness**: 57% believed first-year students are prepared, 12% disagreed, junior residents (65%) more optimistic than senior consultants (40%) ($\chi^2 = 117.7$, df = 4, $p < 0.001$).[11]

Subgroup analyses showed no significant differences across specialties or experience levels ($p > 0.05$).

## DISCUSSION

This study's findings, derived from the "Questionnaire for Surgeons on the Use of Cadavers in Medical Education and Surgical Training" (Appendix A), underscore a robust endorsement of cadaveric dissection among surgeons, with 59% rating it as "Very Important" or "Important" for teaching anatomy (item 1, $\chi^2 = 111.7$, $p < 0.001$). In statistical terms, a p-value less than 0.05 indicates that results are unlikely to occur by chance, and here, a p-value less than 0.001 reflects an exceptionally strong consensus among participants. The Chi-square test, used to analyze categorical responses, confirms that surgeons' preferences were not random but reflected a clear inclination toward valuing cadaveric dissection. This strong support is particularly significant given surgeons' role as end-users of anatomical knowledge in high-stakes operative settings, where precision and anatomical understanding are paramount.

This finding aligns with prior research emphasizing cadaveric dissection's enduring value. Asante *et al.* (2021) reported that 84.5% of medical students viewed cadaveric dissection as the superior method for learning anatomy, highlighting its effectiveness across different learner groups.[21] Similarly, Solanke *et al.* (2018) found that first-year MBBS students perceived traditional dissection as highly effective, reinforcing its foundational role in medical curricula.[22] A recent review further supports this, noting that cadaveric dissection remains a cornerstone of anatomy education, valued for its ability to develop clinical skills and provide hands-on experience unmatched by digital alternatives.[1] These consistent findings across studies underscore the method's critical role in preparing medical professionals for clinical practice.

A notable 76% of surgeons rated cadaveric workshops as "Very" or "Extremely Beneficial" (item 3, $\chi^2 = 62.6$, $p < 0.001$), highlighting the unique advantages of hands-on training.

Cadaveric dissection offers tactile feedback and exposes trainees to the natural variability of human anatomy, both essential for surgical precision. For example, navigating the complex structures of joints or cranial regions requires an intimate understanding of anatomical nuances that digital simulations often fail to replicate. Nwachukwu *et al.* (2023) demonstrated that cadaveric training outperformed virtual reality in arthroscopy, enhancing fine motor skills critical for minimally invasive procedures.[9] This is mirrored by our finding that 70% of surgeons reported improved competence post-workshops (item 5, $\chi^2 = 132.0$, $p < 0.001$), suggesting that cadaveric training directly translates to enhanced surgical performance. A study published by the American College of Surgeons further noted that students and residents who participated in cadaveric labs expressed greater confidence in their anatomical knowledge and technical skills compared to those relying solely on virtual methods.[2]

The near-unanimous support (98%) for increasing cadaver availability (item 6, $\chi^2 = 1371.5$, $p < 0.001$) reflects a pressing need to address resource constraints in medical education. Cadaver scarcity, exacerbated by high acquisition and preservation costs, limits the extent to which this valuable training method can be utilized. Chen *et al.* (2024) demonstrated improved outcomes in reconstructive surgery through cadaveric labs, supporting the 45% of surgeons in our study who favored dissection over virtual tools (item 2, $\chi^2 = 70.1$, $p < 0.001$).[13] The COVID-19 pandemic further highlighted these challenges, with Kochhar *et al.* (2022) noting disruptions to cadaveric training but affirming its necessity.[23] Despite such obstacles, cadaveric dissection remains a global practice, with 90% of African medical schools and the majority in North and South America incorporating it, often reinstating it after initial reductions due to its recognized educational benefits.[1] These findings suggest that medical institutions must prioritize strategies like enhanced body donation programs or inter-institutional partnerships to ensure adequate cadaver supply.

Ethical considerations are central to the use of donated cadavers. In our survey, 62% of surgeons prioritized respect for donor consent (item 4, $\chi^2 = 87.0$, $p < 0.001$), reflecting a deep appreciation for the altruistic act of body donation. This aligns with broader calls for transparent consent processes and respectful handling of cadavers to maintain the ethical integrity of anatomical education.[10] Such considerations are crucial not only for ethical compliance but also for fostering a culture of respect among medical trainees, who learn to value the humanity of their "first patients" through dissection.

The mixed perceptions regarding first-year medical students' emotional preparedness for cadaveric dissection are significant, with 57% of surgeons believing students are prepared and 12% disagreeing (item 7, $\chi^2 = 117.7$, $p < 0.001$). This variability suggests that while many students adapt to the experience, some may require additional support. Kumar *et al.* (2023) recommend gradual exposure to cadavers to help students acclimate to the emotional and psychological challenges.[11] A study in BMC Medical Education further enriches this discussion, finding that while quantitative data showed no significant correlation between dissection hours and professional identity formation (PIF), qualitative insights revealed that dissection fosters humanistic values like compassion, empathy, and respect for patients.[3] Students who engaged in dissection reported a deeper appreciation for patients' personhood, a critical aspect of holistic patient care, while those without dissection focused more on knowledge acquisition, lacking the same emotional engagement. This highlights cadaveric dissection's multifaceted role in shaping not only technical skills but also the ethical and empathetic dimensions of medical practice.

While virtual anatomy tools offer scalability and accessibility, they cannot fully replicate the fidelity of cadaveric dissection. Studies by Sugand *et al.* (2010) and McLachlan *et al.* (2004) emphasize the limitations of teaching anatomy without cadavers, particularly for understanding the natural variety of human structures and three-dimensional anatomy.[14,15] A review notes that dissection is irreplaceable for complex regions like the limbs, where it enhances knowledge retention compared to other methods.[1] Our study supports a hybrid model, combining cadaveric dissection with digital tools, to optimize medical education. However, the consensus among surgeons is clear: cadaveric dissection remains indispensable for developing the practical skills

and anatomical understanding required for surgical proficiency.[9,12] The American College of Surgeons' journal reinforces this, noting that even with technological advancements, cadaveric dissection is favored for its unique educational benefits.[2]

The implications of these findings are profound for medical education policymakers and curriculum designers. The strong endorsement from surgeons, who rely on anatomical expertise in life-saving procedures, provides a compelling mandate to maintain and expand cadaveric dissection in medical curricula. This may involve increased investment in body donation programs, partnerships to share resources, and innovative approaches to integrate dissection with modern teaching modalities. Additionally, addressing ethical concerns and providing structured psychological support for students can enhance the educational experience, ensuring that future surgeons are well-prepared for the demands of their profession. As medical education evolves, balancing tradition with innovation will be key to equipping students with the skills and values needed for safe and effective clinical practice.

## LIMITATIONS AND FUTURE DIRECTIONS

The single-institution focus may limit generalizability. The questionnaire, while pilot-tested, may not capture all nuances. Future multi-institutional studies and qualitative methods could deepen insights. Longitudinal studies tracking surgical outcomes and cost-effectiveness analyses could inform resource allocation.

## CONCLUSION

This study at AIIMS Raipur (2019–2024) confirms cadaveric dissection's essential role, with 59% rating it "Very Important" or "Important" (item 1, $\chi^2 = 111.7$, $p < 0.001$) and 76% acknowledging its benefits for skill acquisition (item 3, $\chi^2 = 62.6$, $p < 0.001$). With 70% reporting improved confidence (item 5, $\chi^2 = 132.0$, $p < 0.001$), cadaveric workshops provide unmatched tactile feedback. The 98% support for increased cadaver availability (item 6, $\chi^2 = 1371.5$, $p < 0.001$) highlights procurement needs. Virtual tools aid foundational learning but cannot replace cadavers' fidelity. For first-year students, controlled exposure with psychological support is recommended, given 12% concerns about emotional preparedness (item 7, $\chi^2 = 117.7$, $p < 0.001$). Cadaveric dissection remains critical for operative proficiency and should be prioritized with ethical guidelines.

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