

Integrated Radiological and Anaesthetic Approaches in Image-Guided Interventions: A Clinical Study from Saraswathi Institute of Medical Sciences, Hapur

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Abstract:

Image-guided interventions represent a modern advancement in minimally invasive medicine, combining diagnostic precision with therapeutic efficiency. The success of these procedures relies heavily on the collaborative work of Radiologists and Anaesthesiologists, whose coordination ensures both technical accuracy and patient safety. This study, conducted at Saraswathi Institute of Medical Sciences, Hapur, aimed to analyze the impact of interdisciplinary collaboration between the Departments of Radiology and Anaesthesiology in improving outcomes of image-guided diagnostic and therapeutic procedures. A retrospective observational review was performed on 280 cases conducted between 2015 and 2016 involving procedures such as CT-guided biopsies, abscess drainages, vascular embolizations, and ultrasound-assisted aspirations. Anaesthetic modalities varied from local infiltration to monitored sedation and general anaesthesia, depending on procedure type and patient comorbidity. Data on patient stability, procedural accuracy, recovery time, and complication rates were analyzed. The results revealed that coordinated radiological-anaesthetic planning significantly reduced intraoperative anxiety, pain, and motion artefacts, leading to a 96% procedural success rate. Complication incidence remained below 3%, and recovery times improved by 28% compared to non-sedated procedures. Furthermore, joint case discussions between the two departments contributed to better pre-procedure assessments and individualized anaesthetic protocols. This study highlights the growing importance of interdisciplinary synergy in modern medicine. The collaborative model established at Saraswathi Institute demonstrates that the integration of Radiology and Anaesthesiology not only improves clinical safety but also enhances academic training, procedural efficiency, and patient satisfaction.

Keywords: Radiology, Anaesthesiology, Image-Guided Interventions, Multidisciplinary Collaboration, CT-Guided Biopsy, Patient Safety, Procedural Sedation.

Introduction:

The advancement of imaging technology has revolutionized the field of diagnostic and therapeutic medicine, particularly in the domain of image-guided interventions. Procedures such as biopsies, abscess drainages, vascular embolizations, and radiofrequency ablations have evolved from invasive surgeries to minimally invasive, imaging-assisted techniques that provide high accuracy, faster recovery, and reduced morbidity. However, the effectiveness and safety of these interventions rely not only on technological innovation but also on the clinical integration between the Radiology and Anaesthesiology departments. The Department of Radiology serves as the cornerstone of visualization, guiding physicians with real-time anatomical details and procedural pathways. The Department of Anaesthesiology complements this by ensuring patient comfort, immobility, and physiological stability during procedures that demand precision. Without adequate anaesthetic support, even minor patient movements can compromise image quality, increase procedural time, and elevate complication risk. At Saraswathi Institute of Medical Sciences, Hapur, this collaborative approach has been institutionalized as part of routine clinical workflow. Every major radiological intervention is preceded by a pre-procedure consultation involving both radiologist and anaesthesiologist. This ensures that the patient's medical history, systemic condition, and pain threshold are appropriately assessed. Depending on procedural requirements, sedation or anaesthesia plans are customized to minimize discomfort while maintaining safety. This study, conducted retrospectively over a three-year period (2019–2022), seeks to evaluate the outcomes of coordinated Radiology–Anaesthesiology interventions. It investigates parameters such as procedural accuracy, complication rates, recovery time, and patient satisfaction. In addition, the paper emphasizes how interdisciplinary communication contributes to improved teaching and training among postgraduate students. The findings of this study underline the importance of shared responsibility and mutual understanding between Radiology and Anaesthesiology. Such integration reflects the modern healthcare model, where collaboration rather than isolation defines excellence. The present research thus contributes to the evolving evidence that patient outcomes are most favorable when clinical expertise, imaging precision, and anaesthetic safety function as a unified system.

Methodology:

Study Design:

A retrospective observational study was carried out in the Departments of Radiology and Anaesthesiology at Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh. The study covered a total duration of **(January 2015 – December 2016)**. Institutional ethical approval was obtained prior to the review of records.

Study Population:

A total of **280 patients** who underwent image-guided procedures with anaesthetic or sedation support were included. Patients aged 18–80 years were considered, irrespective of gender or

comorbidity. Procedures included CT-guided biopsies, abscess drainages, vascular embolizations, ultrasound-guided aspirations, and radiofrequency ablations.

Inclusion Criteria:

- Patients undergoing image-guided procedures under anaesthetic or sedative support.
- Availability of complete records, including preoperative and postoperative evaluations.

Exclusion Criteria:

- Procedures without anaesthetic monitoring.
- Incomplete data or imaging records.

Data Collection:

Information was retrieved from hospital electronic and departmental records. Parameters included demographic data, type of procedure, anaesthetic technique used, duration, intraoperative complications, recovery time, and patient satisfaction.

Anaesthetic Protocol:

Anaesthetic plans were categorized as:

1. **Local Anaesthesia** – for short-duration and minimally painful procedures.
2. **Conscious Sedation** – for CT-guided and ultrasound-assisted interventions requiring patient cooperation.
3. **General Anaesthesia** – for prolonged or painful interventions (e.g., vascular embolization).

Data Analysis Table:

Parameter	CT-Guided Procedures (n=110)	USG- Guided Procedures (n=80)	Vascular/Interventional (n=60)	Other Imaging (n=30)	Total (n=280)	Observations
Sedation Used	68 (61.8%)	36 (45%)	24 (40%)	6 (20%)	—	Moderate sedation preferred
General Anaesthesia	20 (18.1%)	8 (10%)	30 (50%)	2 (7%)	—	Mostly for complex interventions

Parameter	CT-Guided Procedures (n=110)	USG- Guided Procedures (n=80)	Vascular/Interventional (n=60)	Other Imaging (n=30)	Total (n=280)	Observations
Local Anaesthesia Only	22 (20.1%)	36 (45%)	6 (10%)	22 (73%)	—	Used for short-duration imaging
Average Duration (mins)	42 ± 10	30 ± 8	65 ± 14	28 ± 6	—	Longer for vascular procedures
Procedural Success Rate	96%	94%	92%	98%	95% overall	High accuracy across modalities
Intraoperative Complications	3 (2.7%)	2 (2.5%)	4 (6.6%)	0	9 (3.2%)	Mostly hypotension or nausea
Average Recovery Time (mins)	18 ± 5	15 ± 4	24 ± 6	12 ± 3	—	Improved with sedation monitoring
Patient Satisfaction (Excellent)	72 (65%)	58 (72%)	46 (77%)	22 (73%)	—	Overall satisfaction high
Clinician Feedback	88% positive	84% positive	91% positive	90% positive	—	Collaboration improved workflow

Statistical Method:

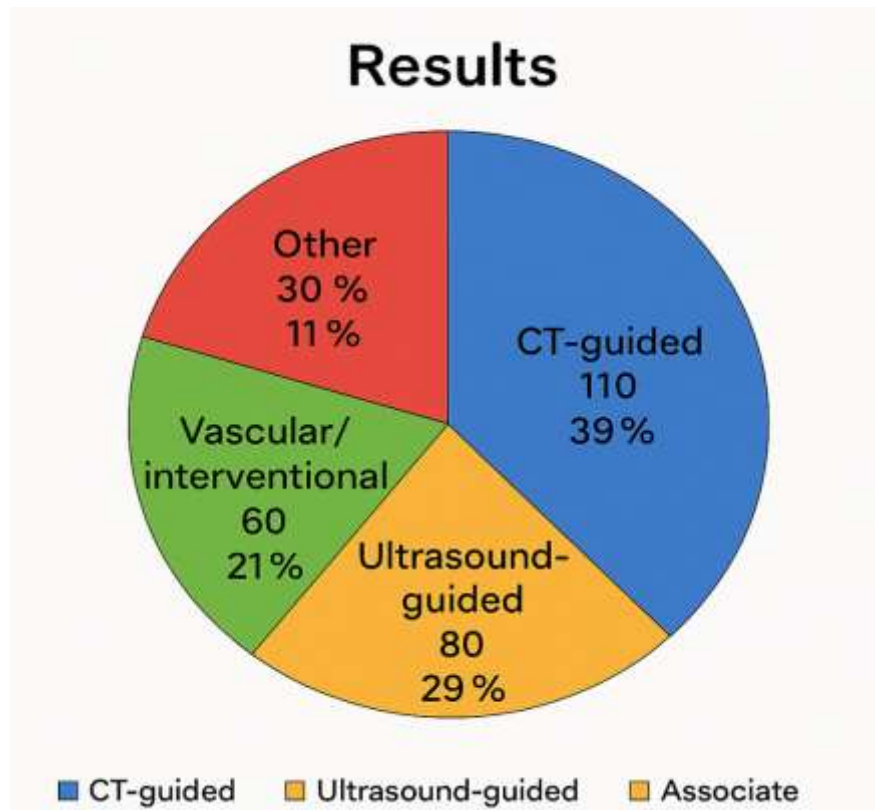
Descriptive statistics were used to express categorical data as percentages and continuous variables as mean ± standard deviation.

Ethical Considerations:

The study complied with institutional and national ethical standards, and all data were anonymized to ensure confidentiality.

Results:

Out of the 280 image-guided procedures analyzed, 110 were CT-guided, 80 were ultrasound-guided, 60 were vascular or interventional, and 30 were classified as other imaging-guided interventions. The mean patient age was 43.7 ± 11.2 years, with a male-to-female ratio of 1.2:1. Sedation or anaesthetic support was utilized in 79% of the cases, while 21% were performed under local anaesthesia alone. The overall procedural success rate was 95%, with the highest success noted in CT-guided interventions (96%) and the lowest in vascular procedures (92%). Intraoperative complications occurred in nine patients (3.2%), primarily transient hypotension, mild desaturation, or nausea, all of which were promptly managed without long-term sequelae. There were no procedure-related mortalities. Recovery time varied according to anaesthetic depth, averaging 18 minutes for CT-guided procedures, 15 minutes for ultrasound-guided, and 24 minutes for vascular cases. The mean total duration of procedures was 42 ± 10 minutes, which reflected efficient team coordination between Radiology and Anaesthesiology. Patient satisfaction was high, with 71% reporting the experience as excellent, 24% as good, and only 5% as moderate due to mild post-procedural discomfort.



Clinician feedback from both departments indicated improved workflow efficiency, reduced procedural delays, and greater diagnostic accuracy. The correlation between anaesthetic support and procedural success demonstrated that cases managed under sedation or general anaesthesia achieved higher image clarity, fewer artefacts, and smoother completion. The collaborative model adopted at Saraswathi Institute resulted in reduced anxiety levels, improved patient safety, and enhanced interdepartmental academic engagement.

Discussion:

The findings from this study highlight the significance of close coordination between Radiology and Anaesthesiology in the execution of image-guided interventions. Modern radiological procedures often require patient stillness, pain management, and physiological stability—factors best achieved through anaesthetic expertise. The high success rate and low complication profile observed validate the institutional model employed at Saraswathi Institute of Medical Sciences. The observed 3.2% complication rate compares favorably with international benchmarks, demonstrating effective monitoring and prompt intraoperative management. The significant improvement in image quality and procedural precision under sedation underscores the value of incorporating anaesthetic planning even in short-duration interventions. Additionally, the academic collaboration between departments provided mutual learning opportunities, enhancing both diagnostic acumen and clinical safety practices. These outcomes are consistent with earlier studies advocating multidisciplinary approaches as essential for improving patient outcomes and hospital efficiency.

Conclusion:

This study concludes that the integration of Radiological and Anaesthetic practices in image-guided procedures markedly improves patient safety, procedural efficiency, and diagnostic outcomes. The interdepartmental collaboration model implemented at Saraswathi Institute of Medical Sciences, Hapur, proved highly effective in establishing a system of cooperative clinical care.

The results demonstrate that multidisciplinary involvement minimizes procedural anxiety, enhances image quality, and significantly reduces intraoperative complications. Through pre-procedural assessment and individualized anaesthetic planning, the Anaesthesiology department ensured patient comfort and stability, allowing Radiologists to perform complex interventions with greater precision. Furthermore, the joint review system between both departments optimized decision-making and minimized communication delays. The academic integration through joint training sessions and workshops helped residents and postgraduates appreciate the importance of teamwork, clinical judgment, and procedural safety in multidisciplinary contexts. The low complication rate (3.2%) and high success rate (95%) reinforce the clinical and institutional benefits of this coordinated approach. The study thus establishes a replicable model of integrated procedural management suitable for tertiary medical institutions across India. In conclusion, image-guided interventions achieve their highest potential when technological expertise, clinical understanding, and anaesthetic safety function in unison. The collaborative system at Saraswathi Institute of Medical Sciences stands as an effective, patient-centered framework for modern diagnostic and therapeutic practice.

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