



Recommendations for Safe Practice in Sedation during Transoesophageal Echocardiography: A Report from the Education Committee of the British Society of Echocardiography

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Introduction

Transoesophageal echocardiography (TOE) is an established diagnostic technique which is used with increasing frequency in a number of clinical settings. By definition, it is semi-invasive with the potential for significant complications.⁽¹⁾ Therefore, it requires a high level of expertise and should only be performed by trained individuals. TOE often requires the use of sedation and it is recognized that there is wide variation in practice between cardiac units in the UK.⁽²⁾ It has become mandatory for NHS Trusts to have clear written guidelines for the use of sedation during procedures.⁽³⁾ This document has been written in order to guide safe practice during TOE but with a particular emphasis on safe sedation. The document therefore extends the recommendations for performing transoesophageal echocardiography published by the Working Group on Echocardiography of the European Society of Cardiology.⁽⁴⁾ The following recommendations are targeted at cardiology departments rather than the intensive care unit/intraoperative setting. These guidelines are intended for adult TOE only.

Recommendations

Staff

The British Society of Echocardiography (BSE) is actively promoting Departmental Accreditation for all aspects of echocardiography. Departmental Accreditation covering TOE requires a nominated senior clinical lead, which in most cases will be a consultant cardiologist with an interest in cardiac imaging, and a senior technical lead, which in most cases will be a senior sonographer. It is the responsibility of the senior clinical lead to organize and manage many of the issues raised by this document.

1. **Primary Operator.** A main operator should be identified prior to the start of a TOE with overall responsibility for the patient including the management of safe sedation and coordination of the team members. The operator should hold personal accreditation in TOE from the BSE or an equivalent standard. The operator should have expertise in resuscitation to an advanced level, i.e. Advanced Life Support (ALS). In many cases at present, the main operator is a cardiologist with expertise in TOE, although increasing numbers of sonographers who are not medically-qualified are assuming this role in the UK. Where such a sonographer assumes the role of primary operator it is good practice to have a nominated senior clinician who is immediately available if required. It is recognized that departments will have to ensure local protocols and legal requirements are completed to cover the issue of intravenous drug administration by a sonographer who is not medically-qualified.

2. **Monitor.** A second medically-trained individual should be identified before the start of a TOE who is responsible for monitoring the patient's clinical condition during the procedure, including supervision of the airway and vital signs. In many cases at present, the monitor is a cardiology nurse with experience in TOE rather than gastrointestinal endoscopy. Resuscitation training is mandatory for the monitor i.e. Immediate Life Support (ILS).

3. **Second Operator.** It is desirable to have a third technically-trained person who is responsible for image optimization and acquisition. This second operator should be positioned at the controls of the echocardiography machine and ensure that a full and optimal image library from the procedure is obtained. This second operator should not be responsible for probe handling or for patient supervision but should ideally hold Proficiency Accreditation in Echocardiography. A second operator is particularly important in the patient with more complex pathology or when the procedure is poorly tolerated.

Equipment

Continuous ECG monitoring. This is usually provided by the echo machine.

Pulse oximetry: continuous monitoring during TOE under sedation.

(If consideration is given to the monitoring of carbon dioxide levels in a patient with underlying respiratory disease then it may be more appropriate to ensure anaesthetic back up and/or a change in environment e.g. high dependency area.)

Automated BP monitoring.

Oxygen delivery should be available, including via face mask.

Examination couch with availability for head down tilt.

Suction.

Full resuscitation facilities including a defibrillator, self-inflating airbag and guedel airways.

Emergency alarm call plus telephone with emergency bleep numbers.

Pre-assessment

It is the responsibility of the Primary Operator to understand the clinical indication for the TOE which is normally provided on a request form and/or referral letter and confirm that the TOE is warranted.

It is the responsibility of the Primary Operator to obtain patient consent for the TOE. It is particularly important to ensure that the patient has had an adequate explanation of the procedure so that full consent can be obtained. An adequate explanation includes both the provision of a written Patient Information Leaflet ideally given to the patient at least 24 hours before the TOE, and then a discussion of the procedure with an opportunity to ask questions at the pre-procedure assessment. An adequate explanation will often reduce patient anxiety, leading to a better tolerated and more comprehensive study. For urgent and emergent TOE, the provision of a Patient Information Leaflet may not be possible. Advice should be included in the Patient Information Leaflet or the patient should be told in advance of the procedure that he/she is not allowed to drive, operate heavy machinery, or sign legal papers for 24 hours following sedation.

It is the responsibility of the Primary Operator to identify significant co-morbidity in order to predict likely complications during the TOE. In order to assist in this, a written pre-procedure checklist should be completed and cross checked with the monitor or second operator to facilitate early identification of predictable problems. This should include answers to the following questions –

1. Has the patient fasted for 6 hours ?
2. Drug allergies, specifically lignocaine, midazolam and latex?
3. Difficulty with swallowing?
4. History of oesophageal/gastric disease?
5. Loose teeth or dentures?
6. Cervical spine disease?
7. Ability to lie flat?
8. Anticoagulation ? Has a recent INR been done?

A 6 hour fast should ideally be observed, with clear fluids allowed up to 4 hours, except in emergency situations where the benefits of proceeding outweigh the risks. It is the responsibility of the Monitor to ensure that baseline observations are recorded including heart rate, blood pressure and oxygen saturations on air. The Primary Operator must be satisfied that the TOE can be completed in the knowledge of these results. Specifically, low heart rate, hypotension or hypoxia should be taken into consideration whether to proceed with TOE and whether to use conscious sedation.

Current medication needs to be determined and evaluated as to its possible effects on the TOE and any sedation used. If the patient is anticoagulated with warfarin or equivalent agents, the Primary Operator should ensure that the INR has been checked recently and is within an acceptable range for the patient.

Probe decontamination

It is the responsibility of the primary operator to ensure that the TOE probe has been adequately decontaminated prior to the procedure according to local health and safety guidelines. Many departments use a protective latex sheath on the probe and this should be checked for any damage or leaks.

Patient preparation listed in chronological order

Intravenous access

All patients require secure intravenous access with a flexible cannula (rather than a butterfly needle), when sedation is used.

Local anaesthesia

Topical local anaesthetic is helpful to reduce discomfort at the back of the throat and to reduce the gag reflex. The risk of aspiration during TOE is small provided there is good attention to suction of the upper airway. Side effects of topical local anaesthesia are rare but include potentially life threatening laryngospasm.⁽⁵⁾ This highlights the importance of adequate resuscitation facilities and senior medical cover.

In the rare situation of lignocaine allergy it is possible to perform a TOE without local anaesthetic spray.

Conscious Sedation

Conscious sedation is optional during TOE and the decision to opt for sedation must be made by the Primary Operator following discussion with the patient. Some patients prefer not to have conscious sedation. This has the advantage of a more rapid recovery post procedure with an earlier discharge time. Many patients prefer to have conscious sedation, although should understand that they will not receive a full anaesthetic. Conscious sedation offers the advantage of improved patient toleration of the procedure but does carry the risk of side effects depending on the medication used. Persons involved in TOE must understand that any drug which depresses the central nervous system has the potential to impair respiration, circulation or both. It is mandatory that individuals who administer intravenous sedation should have received appropriate instruction and training. Departments undertaking TOE should take account of local variation in policy towards conscious sedation.

The BSE emphasizes the concept of conscious sedation - "A technique in which the use of a drug or drugs produces a state of depression of the central nervous system enabling treatment to be carried out, but during which verbal contact with the patient is maintained throughout the period of sedation."

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TOE should not be a painful procedure and it is therefore crucial that sedative drugs are not used to alleviate pain. Pain during a TOE is often an indicator of significant complications e.g. oesophageal trauma. Use of sedative drugs for analgesia will often lead to over sedation.

Benzodiazepines are the commonest drugs used for conscious sedation in clinical practice, of which midazolam is most widely used. The use of a single agent is preferable as combinations of drugs e.g.

opioids, may lead to a higher rate of respiratory depression and cardiovascular collapse. Alternative agents, including opioids, may be considered if there are concerns regarding the use of benzodiazepines, for example with paradoxical hyper-reactivity to midazolam. The operator should understand the pharmacological properties of the drug used and should have reversal agents immediately available, i.e. flumazenil.

Midazolam should be provided in ampoules of 1mg/ml as this is far safer than high concentration preparations.(3) The ampoule should be checked by a second individual and the syringe labeled accordingly. Aliquots of 1mg at a time are given with adequate intervals to gauge effect – these intervals may be as long as 3 minutes or more. A reduction to 0.5mg aliquots may be indicated in more elderly patients or those with co morbidity such as respiratory disease. The exact dose needed to achieve safe sedation is variable, but it is both sensible and safer to use the minimum amount of drugs within the manufacturers' guidelines. A common dose is 2mg IV midazolam, reduced to 1mg in patients over the age of 65 years, and it is unusual to require more than a total dose of 5mg, although some patients do tolerate higher doses without inducing deep sedation. If a patient requires more than 5mg, this is an indicator that anaesthetic input may be required. If verbal responsiveness is lost, it should be recognized that the patient requires a level of care identical to that needed for general anaesthesia. Patients occasionally become restless or even violent following sedation. This situation can sometimes be salvaged by reversing the sedation which may allow the TOE to proceed but when such difficulty can be anticipated, general anaesthesia is usually the best option. Alcoholics and regular benzodiazepine users are notoriously difficult to sedate and their response may be unpredictable or even paradoxical on occasions.

In the event of needing to use flumazenil, the initial dose is 200mcg IV over 15 seconds followed by further 100mcg doses at 60 second intervals. The usual dose range is 300-600mcg with a maximum total dose of 1mg. It is important to appreciate that flumazenil has a shorter duration of action than midazolam which can lead to re-sedation at a later stage (after an hour). This highlights the importance of post procedure monitoring.

Oxygen should be available to all patients receiving intravenous sedation. This will usually be 2 litres/min via nasal cannulae. Particular caution needs to be employed in patients with chronic obstructive airways

disease(COPD) due to the risk of carbon dioxide retention. Oxygen should also be given to patients with significant comorbidity or over the age of 60 who have not been given conscious sedation.

Vital signs (heart rate, oxygen saturations, BP, conscious level) should be recorded regularly during the procedure by the Monitor.

If oxygen saturations drop below 90% this is an immediate indicator to reassess the patient and consider calling for anaesthetic help if there is no improvement with IV flumazenil. Deterioration of conscious level with loss of verbal communication (i.e. deep sedation) should also prompt action.

Once an adequate level of sedation/patient preparation has been achieved then the study can proceed. It is beyond the remit of this document to comment on the technique of TOE which has been described elsewhere. ⁽⁷⁾

Post procedure

Once the probe has been withdrawn the patient requires re-evaluation of their vital signs. Particular attention should be paid to clearing the airway of any residual secretions. The patient should be moved to a recovery area, which should be in close proximity to the TOE procedure room. Clinical monitoring must be continued into the recovery area. The recovery area should have facilities for ECG monitoring and measurement of heart rate, blood pressure and oxygen saturations. This area should be adequately staffed in order to detect complications which require further medical review. Patients who have received sedation require continuous observation until the effects have worn off completely. This observation in the recovery area should be by staff other than the Primary Operator, Monitor and Second Operator if these individuals are to return to the TOE room.

It is good practice to inform the patient of the examination findings prior to discharge and explain the process for their further medical management e.g. TOE report to be sent back to the referring clinician. There should be written documentation of vital signs prior to discharge.

There should be confirmation that the patient has a safe mode of transport home with a companion if the patient has received conscious sedation. Patients should be advised to have a relative or friend available for the rest of the day of the procedure when sedation has been given. Written instructions and contact details should be given to the patient telling them what to do if complications arise. It is recommended that patients who have received sedation should not drive, operate machinery, drink alcohol or sign legal documents for 24 hours.

Audit

Records of outcome and adverse events should be taken as part of the patient plan and kept and used for audit of departmental practice. Departments should carry out regular audit of their TOE service with particular attention to adverse incidents.

Key points - general

- TOE is semi-invasive with the potential for complications
- TOE should only be performed by adequately trained individuals
- Patient preparation is essential with identification of relevant comorbidity
- Formal documentation and cross checking of pre-procedure checklist
- The Primary Operator needs to be supported by an assistant (Monitor) who will record vital signs and manage the airway
- ECG and oxygen monitoring must be available throughout
- Ensure appropriate environment and equipment including post procedure care

Key points – sedation

- TOE is not a painful procedure
- Not all patients will require or request sedation
- Concept of 'conscious sedation' is central to safe practice
- Midazolam should be given in 1mg or 0.5mg increments ensuring the minimum dose is achieved, with adequate time intervals between increments to allow for effect. Usually less than 5mg is adequate.
- Additional intravenous drugs such as opiates increase the chance of respiratory depression and local arrangements for anaesthetic support should be in place under these circumstances
- Flumazenil in 200mcg aliquots should be immediately available
- Early anaesthetic input is essential if oxygen saturations drop below 90% or if verbal contact is lost despite corrective measure e.g. flumazenil
- Appreciation that some patients may require anaesthetic input and a more appropriate environment from the outset e.g. high dependency area, in order to perform TOE safely

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