The Hypertensive patient and Sedation

Introduction

Hypertension is an important challenge worldwide because of its prevalence and its role as a risk factor for cardiovascular and renal disease. This has associated long term effects on morbidity and mortality which we need to bear in mind when planning sedation.

The link between elevated arterial blood pressure and cardiovascular disease is well established. Evidence that moderately elevated blood pressure is associated with increased perioperative risk is limited, but cardiovascular stability may be compromised under anaesthesia and sedation (1).

In hypertensive surgical patients, hypotension as well as hypertensive episodes are more likely to be exhibited. They exhibit exaggerated hypotension and are prone to hypertensive responses postoperatively. These are both associated with arrhythmias and/or myocardial ischaemia, as well as cerebrovascular accidents (2).

Therefore, ensuring that a patient's blood pressure is well-controlled will allow sedation practitioners to manipulate physiology and pharmacology more safely during sedation.

Prevalence

The estimated total number of adults with hypertension in 2000 was 972 million. Of these, 333 million were estimated to be in economically developed countries and 639 million in economically developing countries (3).

One in three adults worldwide has raised blood pressure (4); one in five adult Africans have hypertension (5). The incidence rises with increasing age. Unfortunately, people are often unaware of the diagnosis with 29% of diagnosed

patients with hypertension on treatment and only 45% of those treated with antihypertensive medications having controlled disease (6).

Definition of hypertension

Hypertension in adults is defined as:

- a resting systolic blood pressure (SBP) of 140 mm Hg or greater and/or
- a diastolic blood pressure (DBP) of 90 mm Hg or greater in adults who are not taking antihypertensive medication (7,8).

It is interesting to note that younger adults are more likely to have elevated diastolic blood pressures, whereas older adults are more likely to have elevated systolic blood pressure (6). Due to the increasing rigidity of the arterial circulation, systolic blood pressure rises with age (19).

While it used to be thought that DBP is the most important determinant of outcome and the prime target for blood pressure control, current thinking is that systolic pressure hypertension, is the crucial issue. As a result, systolic hypertension is now regarded as the principal target for blood pressure control in older patients (9).

Preoperative evaluation

Preoperative evaluation remains one of the cornerstones of sedation practice. Here we can determine the risk of the patient and whether a patient qualifies for sedation outside the operating theatre.

The following considerations regarding the *type of procedure* planned should be taken into account:

- How long will it take?
- What is the level of pain involved and how will this be managed e.g. for dental procedures we can use a local anaesthetic vs. dermatological

procedures where local anaesthetic blocks can often not be used. Pain can be severe and management is dependent on the analgesic options available to the sedation practitioner.

- Where will it take place – e.g. in a dental surgery, facility or in an operating theatre.

Patient specific issues

An approach to whether the patient is fit for sedation outside the operating theatre must follow the guidance from guidelines on conscious sedation. This is the standard protocol we would use for any other consultation.
This includes looking at the medical history questionnaire, past surgical history, including both general anaesthetic use and sedation, allergies, chronic medication, followed by a physical examination and basic investigations as deemed suitable.
A focused airway examination as to patency of the airway is extremely important.

Medical History

Based on the medical history, we should be able to determine whether hypertension is primary or secondary. (This discussion is limited to the hypertensive patient without any underlying cause.)

Almost 95% of cases are caused by essential hypertension. The remaining five per cent is “secondary”, in which the underlying cause of the high blood pressure is a known medical condition. These can be categorised into vascular pathology, such as coarctation of the aorta or renal artery stenosis, endocrine conditions, particularly phaeochromocytoma, Cushing’s syndrome and primary hyperaldosteronism, renal disease, obstetric causes, and misuse of drugs for either clinical or recreational purposes(1).

Other causes that can contribute are a high salt intake, alcohol, obesity, and reduced physical activity(6).

The patient must be asked about any previous surgery or procedures done using sedation or general anaesthesia. We specifically ask for any associated complications or adverse events related to sedation. Problems encountered with previous procedures e.g. airway compromise can in itself be a guidance for our approach to sedation.

Ask about any known allergies – drug allergies but also egg and soya allergies keeping in mind our choice of medication used for sedation. Any egg and soy allergy may be a contraindication to the use of propofol. When planning diagnostic procedures e.g. scans, knowledge of previous allergies to contrast media is valuable.

Drug history

We need to ask about the use of chronic drugs by the patient. This includes homeopathic remedies, which many people do not consider to be "medication", but can have significant effects on blood pressure.

The class of anti-hypertensive drug is also important to consider as they may have an influence on the haemodynamic response to medication administered as well as the surgical procedure itself (2).

The treatment of hypertension has a marked effect on complications, reducing the incidence of stroke and cardiac failure, and substantially improving five-year morbidity and mortality. The drugs commonly used for hypertension include (10):

Drug group	Example	Action and effect
Thiazide diuretics	Hydrochlorthiazide, indapamide	Block sodium channels
Beta blockers	Atenolol, bisoprolol, carvedilol,esmolol,	Slow heart rate, improve ventricular filling, block renin
Angiotensin converting enzyme inhibitors	Perindopril, enalipril	Block angiotensin converting enzyme
Angiotensin-2 inhibitors	Candesartan, losartan	Block angiotensin-2 receptors
Calcium channel blockers	Long-acting nifedipine, amlodipine	Vasodilation

Possible negative effects of antihypertensive drugs

- Diuretics
  - Hypokalaemia – thiazide/loop diuretics
  - Hyperkalaemia – potassium sparing diuretics
- Sympatholytics

- Beta adrenergic blockers – bradycardia, myocardial depression, enhanced bronchial tone
- Alpha adrenergic blockers – postural hypotension, tachycardia

- Calcium channel blockers (11)
  - Actual clinical experience reveals that using calcium channel blockers is generally not a significant problem for anaesthetists. Nonetheless, the potential for problems exist. They may potentiate the effect of midazolam, and the sedation practitioner should titrate midazolam to effect.
  - In large clinical trials, verapamil and diltiazem caused the following cardiovascular abnormalities in decreasing order of frequency:
    - First degree AV block (2,4%)
    - Bradycardia (1,7%)
    - Second or third degree AV block (0,8%)
    - Congestive heart failure (<1%-1,8%)
- ACE inhibitors
  - By far the most contentious issue when considering anaesthesia/sedation
  - Hypotension has been attributed to the use of ACE inhibitors and it has therefore largely been requested that it be omitted on the day of surgery for general anaesthesia. For procedures under sedation we recommend that patients take their regular dose of the drugs
  - Hypotension does respond to fluid resuscitation
  - Hyperkalaemia

The decision to stop the use of ACE inhibitors on the day of the procedure was a principle traditionally adopted for procedures done under general anaesthesia. However, in specifically looking at endoscopy under sedation, no evidence based guidelines regarding anti-hypertensive therapy discontinuation is currently available (12). Tang et al showed that taking anti-hypertensive therapy prior to the examination, regardless of medication class, was not associated

with procedural hypotension (12). They therefore suggest that preoperative antihypertensive treatment during the perioperative period be continued.

More importantly, Tang et al concluded that pre-procedure hypotension (possibly as a result of bowel preparation medication or dehydration) was a higher risk for procedural hypotension than taking or omitting blood pressure medication.

Physical examination

Since the diagnosis of hypertension will automatically require further evaluation, we need to be sure of the diagnosis. Also, in order to assess blood pressure correctly during procedures under sedation, these same principles will apply.

How to assess blood pressure properly: (13)

- Sit with the arm bared and resting at heart level
- No caffeine or cigarettes in the half hour prior to these measurements
- Measurement taken after 5 minutes rest
- Appropriate cuff size to be used as this can either over or underestimate readings
- Systolic and diastolic to be recorded
- Two or more readings are to be taken
    - Do not defer surgery on the basis of a single blood pressure reading on arrival for sedation. Obtain several further readings. The general practitioner may have a record of previous readings which may be useful (9).
- If repeated readings differ by 10mm Hg or more – more readings are required
- Use both arms and use the side of the higher reading – this may however not be practical in our setting as currently, electronic monitors are used

and the other arm in most cases left for use of the intravenous infusion and pulse oximeter.

Is the hypertension severe?

All international sedation guidelines use the ASA classification to define risk before sedation. According to them ASA I patients (normal, healthy patient with no systemic disease) and ASA II patients (mild to moderate systemic disease but controlled) are the two groups suitable for sedation outside the hospital environment. Hence, our hypertensive patient (ASA II) will ideally have to have optimal management and evaluation of his/her hypertension prior to the procedure.

In a large orthopaedic audit, hypertension was the commonest reason for deferring surgery accounting for 16,2% of medical cancellations (17).

Few guidelines exist as to which patients should be cancelled to allow hypertension to be treated or the duration of such treatment prior to surgery. There is little evidence for an association between admission arterial pressures of <180mmHg systolic or 110mmHg diastolic and perioperative cardiovascular complications (22).

A recent meta- analysis of thirty papers involving 12995 perioperative patients demonstrated an odds ratio for the association between hypertensive disease and cardiovascular complications of 1.35 which is not clinically significant (14).

James et al suggest that moderate degrees of hypertension (up to 180/120 mmHg), without obvious target organ disease, should never be grounds for postponing surgery (10). At present, the overwhelming evidence is that patients with mild-to-moderate hypertension without subclinical organ dysfunction, or additional risk factors, should proceed to anaesthesia or sedation and surgery without delay. An isolated recording of a very high blood pressure immediately prior to surgery is not necessarily a reason to postpone the surgery. In such

cases, where prior information is available, it may be reasonable to continue to surgery, but there is no evidence for or against this position (10).
What must be taken into account is that many patients are anxious before a surgical procedure. This may increase the blood pressure. One could consider giving the patient a small dose of a benzodiazepine and take the blood pressure again when the patient is more relaxed.

We can categorise the severity of high blood pressure by looking at the measurements and in this way choose a course of action accordingly.
According to the Oxford Handbook of Anaesthesia:

- **Patients with stage III hypertension, SBP>180 or DBP >110, should ideally have this treated prior to elective surgery. Sedation should not ne done under these circumstances as this is usually done outside the operating room.**
- **Stage 1 (systolic 140-159mmHg, diastolic 90-99mmHg) and stage 2 (systolic 160-179mmHg and diastolic 100-109mmHg) hypertension is not an independent risk factor for perioperative cardiovascular complications. Surgery should normally proceed in these patients. Consider the use of a sedative before the procedure and take the blood pressure again.**
- **If a patient has stage 3 hypertension (systolic >180mmHg, diastolic >110mmHg), with evidence of damage to the heart or kidneys, defer surgery to allow blood pressure to be controlled and the aetiology to be investigated. There is, however, no level-one evidence as to how long the operation should be delayed (>4weeks is often recommended) or that this strategy reduces perioperative risk (1). These patients are ASA classification 3 to 4 and do not qualify for sedation outside the operating theatre.**

Patients with stage 3 hypertension considered fit for surgery in all other respects and with no evidence of end-organ damage should not be deferred

simply on the grounds of high blood pressure. Attempt to ensure cardiovascular stability, using invasive monitoring where indicated and actively control excursions in mean arterial pressure greater than 20% from baseline (20). When the procedure is done in-hospital then it is usually no problem.

The above is in line with a recent article by James et al who argues that the benefits of a surgical procedure outweigh the relative risk of complications due to an acute hypertensive emergency (10). The authors recommend that surgery be commenced in most cases, and that an intermediate group be considered, where the few remaining patients with uncontrolled hypertension be investigated and monitored for a specified period to optimise blood pressure control before rescheduling as it seems that resistant hypertension risk is higher than that of a treated patient one who is uncontrolled (10).

The longstanding effects of hypertension also need to be considered since the association of hypertension with end-organ damage (ischaemic heart disease, heart failure, renal failure) contributes significantly to the likelihood of perioperative cardiovascular complications (1). Therefore, the presence of coronary or cerebrovascular disease, impairment of renal function, signs of left ventricular hypertrophy, or heart failure automatically puts patients in a high risk category (6). Here again when evaluating risk before sedation one should remember that only ASA 1 and 2 patients qualify for sedation outside the operating theatre.

As a result, evidence of comorbid disease should be looked for before sedation as hypertension is commonly seen as one of several chronic conditions managed concomitantly. The sedation practitioner must look In particular for:

- Ischaemic Heart Disease
- Cardiac failure
- Renal dysfunction
- Previous cerebrovascular accidents

- **Obesity – of note here is an association with obstructive sleep apnoea; the additional use of an OSA questionnaire in this setting would be advantageous as patients may not be aware of their condition**
- **Other risk factors for vascular disease that may be synergistic include smoking, hyperlipidaemia, and diabetes.**

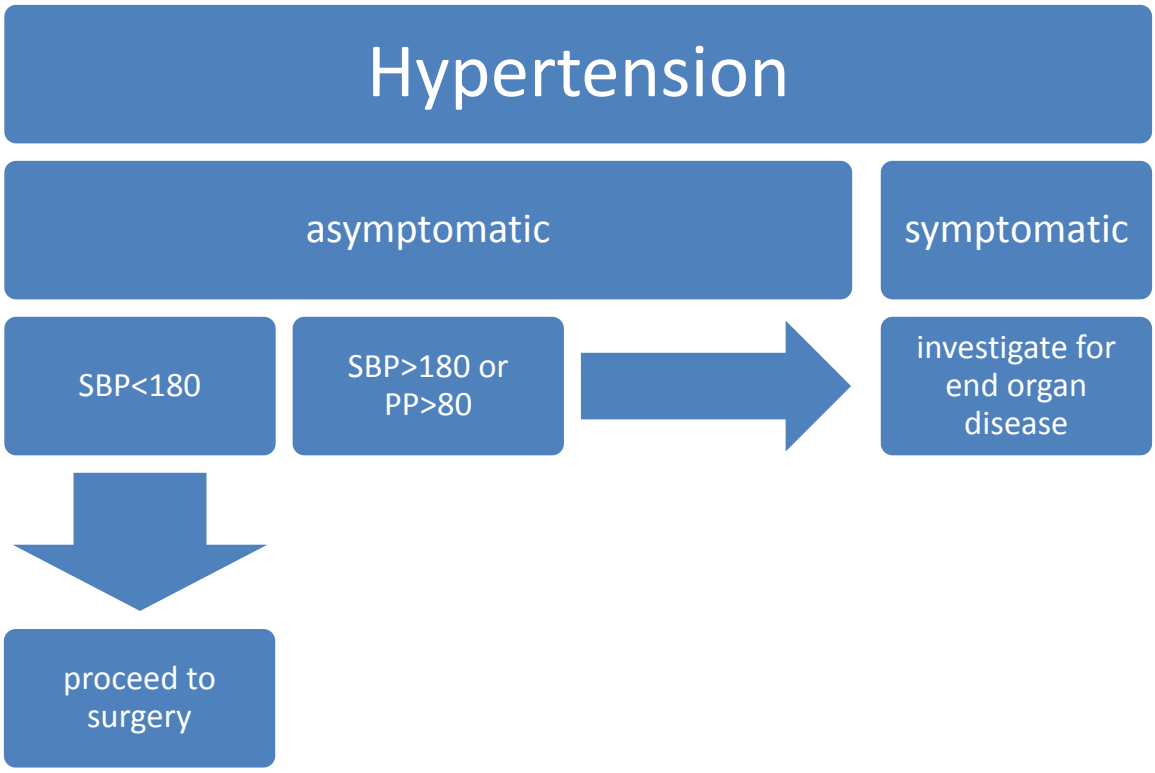
In sedation terminology we call the above conditions the "red flags". It means that we should be very careful when we administer sedation.

These conditions may require further investigation and/or treatment in addition to control of elevated blood pressure (21). A useful exercise here would be to contact the patient's general practitioner or physician to ascertain any evidence of end organ damage.

An approach in our setting would be to do some simple pre-operative investigations:

- **BP measurement**
- **Urine "dipstix" – particularly for microalbuminuria**
- **ECG – evidence of ischaemia, left ventricular hypertrophy**
- **Ureum and electrolytes**
- **Glucose levels in the diabetic patient**

Algorithm for the approach to a patient with previously undiagnosed hypertension, presenting for anaesthesia and surgery can be seen in the table below (10). This approach would be reasonable as an evaluation tool to decide whether to proceed with a procedure under sedation outside the operating room. It is imperative to decide whether this is an ASA 1 or 2 patient.



(NOTE: Routine investigations in all cases including ECG, U&E and urinalysis especially in diabetics)

Intraoperative management

Monitoring

Monitoring of the patient during minimal and moderate sedation and analgesia (conscious sedation) is to be continuous throughout the procedure. According to all international sedation guidelines, minimal requirements for safe monitoring of the patient during sedation include:

- **ECG monitor. There is not universal agreement that an ECG monitor is mandatory in sedation for ASA 1 and 2 patients. With paediatric sedation an ECG monitor should be used.**

- **Pulse oximeter (15)**

- Transcutaneous measurement of ratio of venous to arterial blood, done by percentage of absorption of lightwaves
- Saturation calculated by mathematical algorithm
- Assumes absence of methaemoglobin and carboxyhaemaglobin
- Promptly and reliably, excluding artefacts, identifies hypoxemia more quickly than clinical signs such as cyanosis or disorientation which occur much later.

  The use of the pulse oximeter is considered mandatory for moderate sedation, but not for inhalation sedation with nitrous oxide in concentrations of 50% or less.

- Blood pressure monitoring device (currently electronic devices are widely used which gives us the option to have one monitor that can monitor the ECG, pulse oximetry, pulse rate, respiratory rate)
  - Oscillometric measurement of peak oscillation magnitude of arterial flow which reflects mean arterial pressure and pulse
  - Non-invasive
  - Appropriate cuff size is critical
  - A mathematical algorithm calculates systolic and diastolic pressure, however,
    - Underestimates high blood pressure
    - Overestimates low blood pressure
  - When in doubt, use a manual sphygmomanometer

- Stethoscope
  - Essential for clinical assessment of respiratory and cardiac function in the event of mechanical device failure or discrepancy
  - A pre-cordial stethoscope is a very useful device to strap on to the chest; this gives us also valuable information regarding breathing.

Easy to assemble and also valuable in the patient with asthma to listen to possible wheezing.

- A pre-tracheal stethoscope is also available. This can be connected to an audio device so that all the members of the sedation team can assist with monitoring.

- Thermometer. This can very useful in children who often present with runny noses. The sedation practitioner has to make certain the child has not got an upper respiratory tract infection in which case the procedure must be postponed.
- Blood glucose testing device (glucometer). Is mandatory to have especially with diabetic patients. When there is delayed recovery after sedation the blood glucose level should be monitored.
- Capnograph. The use of this monitor is debatable. It is not yet considered mandatory but can be valuable in patients with OSA and in children. It remains the gold standard for the early diagnosis of hypoxia.
- Nasal prongs with capnography is strongly recommended for the obese patient, but not compulsory.

Drugs

Drugs used to induce sedation for patients with hypertension

1.Propofol

Propofol is a sedative-hypnotic agent with a very favourable pharmacokinetic profile for sedation. It causes a decrease in cerebral metabolism, blood flow, and intracranial pressure. It has been shown to cause profound hypotension ***when given as a bolus***; this effect is most likely due to direct myocardial depression and a decrease in systemic vascular resistance. Its administration to elderly patients has been associated with alterations in the cardiovascular response such as inotropic effects or a decrease in systemic blood pressure because of decreased peripheral resistance (21).

There is no reason that this drug cannot be given for sedation of the

hypertensive patient if given carefully. Care should be exercised and the drug must be titrated to effect. The blood pressure must be monitored on a continuous basis.

2.Ketamine

Has become one of the most significant drugs in sedation practice. It is believed to cause dissociative sedation (16) which is characterized by sedation, analgesia, amnesia, preservation of the protective reflexes, and a stable cardiovascular system. The above is precisely what we as sedation practitioners want when we administer sedation.

Ketamine was originally used to induce general anaesthesia.
The question is where do we stand with its use in the hypertensive patient. It is well known that ketamine inhibits catecholamine uptake, which exerts a sympathomimetic effect with an increase in heart rate, blood pressure cardiac output with possible hypertension.
But do we really see this when we administer small doses of ketamine especially when we use it with propofol for sedation. It seems this drug is safe in the controlled hypertensive patient when small doses are used.

3.Ketofol

The combination of ketamine and propofol (ketofol) used in a single syringe combination has become very popular for use as boluses or part of a continuous infusion technique using TIVA or TCI, for sedation. Several synergies are apparent between the two drugs that make them so attractive to use in combination. Ketamine may cause nausea and vomiting which is dose-dependent; propofol has intrinsic antiemetic properties.

Hallucinations are well known with ketamine sedation that are usually dose-dependent. This is not seen with propofol in the doses that we use for sedation. Ketamine provides amnesia, propofol usually with an infusion of 5mg/kg/hr. Ketamine is known to preserve respiratory drive, but must not be injected

rapidly as it may cause respiratory depression. It is believed that ketamine protects against hypoventilation during sedation.

The addition of ketamine provides analgesia that is lacking in a propofol-only regimen.

From the above it is obvious that the combination can be considered for sedation. The use of ketamine in combination with propofol has been shown to reduce the dose of propofol required to achieve sedation (not oversedation). The combination is believed to result in less toxicity than either drug alone because their complimentary effects enable the use of lower doses if each drug.

There are clinicians who believe that Independent dosing with ketamine and propofol improve procedural sedation compared with the combination ketofol.

4.Midazolam

Midazolam is a short-acting benzodiazepine that is extremely popular in sedation practice. It exerts sedative and hypnotic, muscle relaxant, anxiolytic and anticonvulsant actions. It may cause respiratory depression or hypotension if not titrated to effect. This drug has unfortunately no analgesic actions.

The drug must be used carefully in the adult. When given intravenously the time to maximum peak effect is 10 – 12min.

There is no reason that this drug cannot be given to the hypertensive patient. It may in effect be administered to “test the waters” when a patient is admitted for sedation. If anxiety is the reason for hypertension this will usually lead to a drop in blood pressure.

5.Opioids

Opioids can produce profound analgesia that is often necessary during procedural sedation to compliment the action of the local anaesthetic and to provide postoperative analgesia. The effects of these drugs include analgesia,

drowsiness, mood swings, and mental confusion. The opioids are not sedatives, their sedative properties are usually secondary effects.

For sedation we prefer the short – acting opioids e.g. fentanyl and alfentanil. Tramadol is also popular as boluses and as part of a continuous infusion. It has the benefit of longer postoperative analgesia.

There are 3 groups of opioid analgesics:

- opioid agonists, which interact with central nervous system receptors to produce a physiologic response
- opioid antagonists, which occupy a receptor site without a physiologic response
- opioid agonists/antagonists, which possess properties of both groups. Research has shown that the anticholinergic effects of opioids can lead to increases in heart rate because of the vagolytic properties of these agents (6). When used as conscious sedative agents, opioids have been associated with hypotension, peripheral circulatory collapse, and cardiac arrest (18).
  However, hypertension does not contraindicate the use of opioids

Emergency drugs

As we are dealing with hypertension that could be a medical emergency for us during sedation, we need to say something on emergency drugs. All sedation guidelines guidelines provide a broad prescription of medications and equipment that are mandatory with any case requiring sedation. The prescribed minimum emergency drugs that should be available at the time of sedation include drugs like:

- Naloxone for reversal of the effects of the opioids
- Flumazenil for reversal of the action of benzodiazepines
- Adrenaline for anaphylactic shock

- Atropine or glycopyrrolate that are anticholinergic drugs that could be used for bradycardia and to decrease secretions. Both should be used with caution when ketamine is administered for sedation. There could be a higher incidence of nausea and vomiting, recovery agitation, and adverse airway events.
- Ephedrine or phenylephrine (or other □-agonist) for treatment of persistent hypotension
- Lignocaine 2% or amiodarone for treatment of abnormal heart rhythms
- Glucose 50% for treatment of hypoglycaemia
- Hydrocortisone, methylprednisolone or dexamethasone for allergic reactions, bronchospasm, anaphylactic shock
- Promethazine or any other antihistamine for treatment of allergic reactions
- Nitroglycerine spray is useful for treatment of angina pectoris but could also be used for treatment of hypertension during the operation.
- Aspirin for the patient with a myocardial infarction
- Salbutamol for the asthmatic
- Suxamethonium availability is controversial. I believe this is a useful drug to have. In cases of resistant laryngospasm this may be the only option available to relieve laryngospasm. Take note that if we use it we do not need the full relaxant dose; only a small dose of say 5mg, and the drug can be administered intramuscularly also.
- Intravenous fluids for rapid administration of medication

Sudden hypertension during the procedure

With hypertension, the potential issues of concern during sedation would be acute hypertension, hypotension, arrhythmias or other related vascular pathology e.g. cardiac ischaemia, or even a cerebrovascular accident. Any drug given by the sedation practitioner for hypertension must be titrated to effect. Thus in addition, we require the availability of at least one of the following drugs:

- **Vasodilators**
  - **Hydralazine if used it should be given by a slow intravenous injection, 5mg diluted with 10ml sodium chloride.**
  - **Magnesium sulphate. This is the drug of choice for me if I do need to bring the blood pressure down and should be available for every sedation practitioner. It is available as a 1gm/2ml 50% magnesium sulphate ampule. I dilute it in a 10ml syringe with then 100mg/ml. One ml (100mg) is then administered slowly in boluses until the desired effect is achieved. Note that patients may complain of "burning of the face" because of the intense vasodilatation.**
  - **GTN is available as 300mcg sublingual tablets or as a Nitrolingual Pumpspray® that delivers glyceryl trinitrate 400mcg/metered dose**

- **Β-blockade**
  - **Esmolol(Brevibloc®) usually administered by an intravenous infusion**
  - **Labetalol(Trandate®) if used as an intravenous injection 50mg over at least I minute and titrated to effect. Can be repeated after 5 min if necessary.**
- **α-blockade**
  - **Phentolamine(Rogitine®) is not to be used for treatment of hypertension outside the operating theater**
- **The ACE inhibitors**
  - **They are not available for intravenous administration. A drug like captopril which is in tablet form of 25mg per tablet can be crushed and administered sublingually.**

The hypertensive emergency

Precise blood pressures of significance are not defined but sudden elevations to systolic blood pressure of ≥180mm Hg or diastolic blood pressure of ≥110mm Hg are generally regarded as an acute hypertensive episode (6)

Hypertensive emergency and crisis are terms used to describe an acute hypertensive episode accompanied by symptoms of end-organ damage. The event includes symptoms of chest pain, headache, or visual disturbances (21).

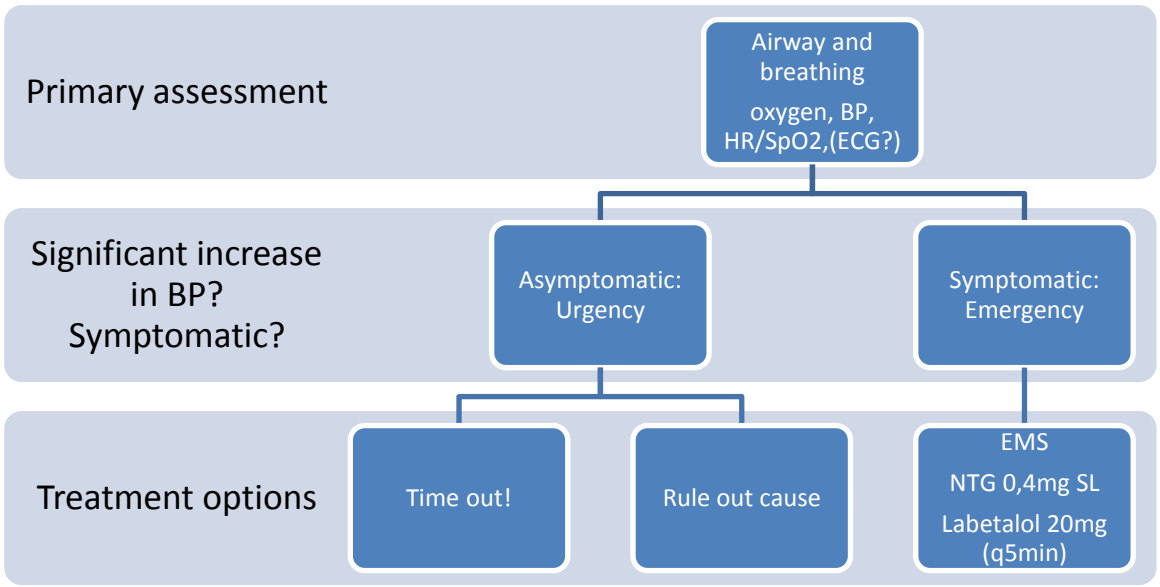
In this case, emergency medical services should be called to transfer the patient immediately to a hospital. (The procedure should be stopped.) While waiting, emergency treatment can be started in line with current BLS and ACLS protocols. Treatment directed at blood pressure lowering should aim to lower blood pressure by ~20% in about 30-60 minutes. However, any signs suggestive of a stroke limits intervention to supportive management until the lesion can better be defined and treated.

The sedation practitioner must make certain that there are not other reasons responsible for hypertension. The following causes of hypertension must be considered.

- **Related to sedation**
  - **Inadequate analgesia. When a procedure is done with the use of local anaesthesia it must be considered to give more local anaesthesia for pain. Don't give a sedative if the patient has pain.**
  - **Inadequate depth of sedation**
  - **Transient action of administered drug e.g. local anaesthetic with adrenaline infiltration**
  - **The drugs used for sedation:**
    - **Propofol commonly causes transient hypotension but can cause significant hypotension**
    - **Ketamine can cause hypertension in excessive doses**
    - **Midazolam can cause hypotension in excessive doses**
    - **Opiates not known to cause hypertension**

- **Measurement error (see above)**
- **Related to pre-existing disease**
  - **Raised intracranial pressure**
  - **Early acute myocardial infarction**
- **Related to procedure**
  - **Painful stimulus**
- **Other**
  - **Bladder full**
  - **Use of homeopathic medications (long-acting)**
- **Anxiety**

An approach to intraoperative hypertension in summary (17):



In our setting, our treatment options include:

- **Magnesium sulphate – diluted and give in small amounts, may cause uncomfortable facial flushing**
- **Crushed Captopril or other ACE inhibitors given sublingually**
- **Nifedipine(Adalat®) 5mg, 1drop sublingually – very bad taste and may cause severe hypotension and bradycardia especially when opiates were used during sedation**
- **Sublingual nitrate – works well but causes a headache**

Hypotension

Hypotension is defined as a systolic blood pressure of less than 90 mmHg. Hypotensive patients will generally respond to leg elevation or intravenous fluid administration. However, some drugs (as discussed above) can, in certain instances (e.g. dehydration, elderly) result in refractory hypotension requiring the appropriate intervention.

Hypotension is rarely seen during sedation for ASA 1 or 2 patients.

A summarised approach to the hypotensive patient as illustrated by Becker et al (17):

Primary assessment	• Airway and breathing • oxygen, BP, HR/SpO2,(ECG?)
Symptomatic hypotension	• Recline patient • intravenous fluids
No improvement - confirm HR	• Rate <60 - Atropine 0.5mg • Rate 60-100 - Ephedrine 10mg • Rate >100 - Phenylephrine 0.1mg

Postoperative management

Monitoring should continue using ECG, pulse oximetry, and blood pressure measurements. All patients who have received moderate sedation will be monitored in the treatment area or in a designated recovery area as follows:

- **vital signs, pulse oximetry, and pain score every 5-15 minutes x 2 (minimum of 20 minutes) until return to baseline, or**
- **continue every 5-15 minutes until discharge criteria are met**

Patients may develop high blood pressure due to pain, bladder distension (due to fluids and medications given) or anxiety following the procedure. Confusion and disorientation can also contribute. We need to ensure that blood pressure and heart rate are stable prior to discharge. We are obligated to inform patients of possible complications and providing advice on management or contact details for assistance if necessary.

At this time, it is useful to review the course of the procedure. Any problems or complications encountered should be recorded so that this can be kept in mind for the administration of sedation or anaesthesia in the future.

Conclusion

Despite a large and ever growing population of hypertensive patients, these patients can still present us with challenges. A thorough preoperative assessment including history, examination and appropriate investigations is necessary in all patients undergoing procedures under sedation.

Preparation as per sedation guidelines is compulsory in order to provide a safe and successful service. This includes ensuring a safe work environment with access to emergency equipment.

Continuous monitoring of the patient's cardiovascular status is essential to alert us to signs of complications. Remembering that in the current age of technology, the physical examination can be as indispensable. Hence, understanding the pathophysiology of hypertension and the pharmacodynamics of the medication used by the patient and those we utilise for the purpose of sedation is fundamental.

Every patient is different, but preparation and vigilance will give us the ideal chance at the best possible result.

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