Review Article

Hysteroscopy and anaesthesia

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Purpose and source: *Hysteroscopy has become a widely accepted technique in the diagnosis and treatment of various gynaecological conditions. The advent of the fibreoptic endoscope and distending media has largely been responsible for the increasing use of hysteroscopy. It is our aim in this article to review the literature on the frequently used distending media such as carbon dioxide, glycine, dextran, dextrose, sorbitol and mannitol and their anaesthetic implications.*

Principal findings: *The endoscopist chooses the particular medium. Complications due to the distending media occur in <4% of cases. Dilutional hyponatraemia and hypothermia are commonly encountered complications and, in addition, hyperglycaemia and volume expansion can occur. Less commonly encountered complications are embolism with carbon dioxide and pulmonary oedema, renal failure and in rare cases anaphylaxis and encephalopathy. Regional anaesthesia may offer an advantage over general anaesthesia in early recognition of fluid accumulation. Appropriate monitoring should include fluid balance, routine monitoring as well as temperature, electrolytes and blood sugar measurements. Precordial Doppler measurement, central venous and/or pulmonary artery pressure measurement may be of help in detecting as well as treating carbon dioxide and/or air embolism and fluid balance in high risk patients.*

Conclusions: *There is no one commonly used medium and no one medium is devoid of complications. There have been no controlled studies comparing different anaesthetic techniques. Positioning of the patient can give rise to complications such as peripheral neuropathy. Hysteroscopy is a non invasive procedure which entails a short hospital course with minimal postoperative sequelae and may be cost saving.*

Key words
ANAESTHESIA: gynaecology;
EQUIPMENT: hysteroscope, distending media;
SURGERY: gynaecology.

Objectif: *L'hystéroscopie a maintenant fait ses preuves comme outil de diagnostic et de traitement en chirurgie gynécologique. L'introduction de l'endoscopie fibroptique et des substances qui servent à distendre les tissus (médiums de distension) est grandement responsable de l'augmentation de la faveur de l'hystéroscopie. L'objectif de cet article est de procéder à un survol de la littérature portant sur les méthodes de distension les plus employées comme l'insufflation de gaz carbonique, l'irrigation avec la glycine, le dextran, le dextrose, le sorbitol et la mannitol et leur conséquences sur l'anesthésie.*

Principales constatations: *C'est l'endoscopiste qui choisit le médium. Des complications due aux médiums de distension surviennent dans moins de 4% de cas. L'hyponatrémie dilutionnelle et l'hypothermie sont les complications les plus communes. On rapporte plus rarement l'hypervolémie et l'hyperglycémie. L'embolie gazeuse au gaz carbonique, l'oedème pulmonaire, l'insuffisance rénale sont aussi décrites et très rarement, l'anaphylaxie et l'encéphalopathie. L'anesthésie régionale peut présenter un avantage sur l'anesthésie générale en ce qui concerne la détection de l'accumulation de liquide. Une monitorage pertinent comprend le contrôle des liquides. Au monitorage de base s'ajoute de celui de la température et de la glycémie. Le Döppler précordial, la mesure la tension veineuse centrale et/ou de la pression artérielle pulmonaire peuvent être utiles pour détecter et traiter les embolies aériennes ou gazeuses et l'hypervolémie chez les patientes à haut risque.*

Conclusions: *On n'utilise pas les mêmes médiums partout et aucun n'est exempt de complications. Nous ne possédons pas d'études contrôlées qui comparent les techniques anesthésiques. La position de la patiente peut provoquer des neuropathies. L'hystéroscopie constitue un intervention non effractive qui nécessite peu de soins à l'hôpital et dont les coûts sont minimes.*

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Hysteroscopy can be used as both a diagnostic and therapeutic tool. The diagnostic hysteroscope is mainly used in the investigation of abnormal uterine bleeding but can also play a role in the evaluation of primary or secondary infertility, recurrent miscarriages as well as the location and removal of embedded intrauterine devices.[1–3] Hysteroscopic endometrial ablation has gained popularity in the past ten years in the treatment of dysfunctional uterine bleeding.[4,5] This procedure, along with hysteroscopic resection of submucosal fibroids, has provided women with conservative alternatives to hysterectomy.[2,3] Intrauterine adhesions and septaė can also be resected hysteroscopically thus avoiding laparotomy.

While hysteroscopy has only recently been added to the gynaecologists' armamentarium, Pantaleoni had visualized the endometrium well over a century earlier.[6] It was not until the development of a suitable fibreoptic endoscope and distending medium, that hysteroscopy became practical.[1,7] Hysteroscopic intrauterine resection was first described in 1976.[3] This was followed by case reports of various complications. Membership surveys of the American Association of Gynecologic Laparoscopists (AAGL) revealed the following complications:[8,9]

1 Uterine perforation occurs in 2–3% of hysteroscopies and is usually benign provided the perforation does not occur while electrosurgery is being used.
2 Haemorrhage and possible transfusion is related to technique, patient selection and pathology.
3 Nerve injury may occur due to improper positioning of the patient during surgery.

Perioperative peripheral nerve injury accounted for 15% of all claims in the ASA closed claims project database published in 1990.[10,11] A report published in the Anesthesia Patient Safety Foundation newsletter 1994 described peripheral nerve injury as the most common serious complication following 81,765 anaesthetics administered between 1987–1993.[10] Ulnar nerve injury represented one third of all injuries and was most frequent in males.[12] Lower extremity neuropathy is most likely to occur after surgery performed in lithotomy position as happens in most gynaecological procedures. These neuropathies are potentially preventable and occur because of errors in position or padding.[12–14]

A retrospective review of operations performed in the lithotomy position revealed lower extremity neuropathies in 55 of 198,461 anaesthetized patients, giving an incidence of 1 per 3608 cases.[14] There is a higher incidence with the duration in the lithotomy position (>four hours), body mass index ≤20 , and a history of smoking within 30 days of the procedure. Diabetes and peripheral vascular disease are also additional risk factors.[10] Identifying patients at risk and proper positioning may minimize the occurrence of lower extremity neuropathy.

Uterine perforation during electrosurgery can result in bowel or urinary tract injury, that will require laparoscopy or possible laparotomy for treatment. Complications specifically related to distending media occur in <4% and vary depending on the medium used.[8,9,15–30] In this paper we shall review the various distending media used for hysteroscopic procedures and the implications for anaesthetists.

The use of viscous solutions for uterine distension began with Menken's introduction of polyvinylpyrrolidone (Luviskol-k 90.4%), a mixture of linear polymers of different chain lengths and molecular weights. As the substance was yellow in colour and not biodegradable, it had limited usefulness in hysteroscopy.[7]

In the late 1960s and the early 1970s, 10% dextrose in water and low molecular weight dextran 40, (6 and 10%) were used without much success. In 1970, Edstrom and Fernstrom successfully utilized high molecular weight dextran.[1] The practical use of dextrose 5% in water delivered under pressure for uterine distension was initiated about the same year.[7]

Distending media for hysteroscopy

Carbon dioxide

Carbon dioxide was the first medium to be used to distend the uterus. Historically, Lindemann and Porto as well as Sement separately introduced the technique of CO_2 gas insufflation for uterine distension.[2,7] The technique had been pioneered by Rubin in 1925 to insufflate the fallopian tubes,[31] but did not become safe and practical until the introduction of CO_2 insufflators. Because of its wide margin of safety, it was readily adapted for uterine distension for hysteroscopy. Its low cost, ready availability, safety and clarity of vision, makes it a good medium for diagnostic hysteroscopy.

Other gases such as air, N_2O and O_2 were used but the ability of N_2O and O_2 to support combustion together with lower solubility of N_2O in blood, made them unsuitable for hysteroscopy.[32]

Carbon dioxide is a near ideal agent to distend the uterus during diagnostic hysteroscopy. However, care must be taken not to overdilate the cervix as this makes distension more difficult due to CO_2 leakage. Hysteroscopic examination is usually performed using a flow rate of $<100\ ml \cdot min^{-1}$. A constant volume, variable pressure gas source should be used to maintain this flow rate and to maintain the intrauterine pressure <100–120 mmHg to prevent CO_2 embolism.[7,33] Although excellent visualization is achieved, this medium cannot be used in conjunction with operative hysteroscopy as these procedures have open vessels through which CO_2 can gain access to the circulation producing pulmonary gas emboli. Smoke is also generated obscuring the surgical field.

The incidence of carbon dioxide embolism is unknown. In recent reports of 62 cases of hysteroscopy, three patients sustained cardiac arrest as a result of carbon dioxide pulmonary embolus during general endotracheal anaesthesia with controlled ventilation.[15,32,34] The onset was within five to eight minutes of insufflation and was heralded by an initial tachycardia and reduction in $P_{ET}CO_2$. This rapidly progressed to ventricular dysrhythmias and cardiac arrest. Resuscitation was successful in all cases and a "mill wheel" murmur was heard following return of heart activity.

Carbon dioxide is very soluble and its absorption produces acidosis, hypercarbia, arrhythmias and hypertension secondary to catecholamine release.[34] The hypercarbia in the presence of certain inhalational agents increases their arrhythmogenic potential whether used perioperatively or secreted secondary to stress. Careful monitoring of ECG, oxygen saturation and end tidal CO_2 is mandatory. Precordial Doppler and central venous pressure monitoring may be useful for detection and treatment of gas embolism.[35] In the event of suspected air or CO_2 embolus, N_2O should be discontinued and the operative site flooded with saline. The patient should be positioned in the left lateral position, head down, and the gas should be aspirated via a central line. In the future, intraoperative transoesophageal echocardiography may be used in the diagnosis of these cases.[35] The Food and Drug Administration (USA) recently reviewed five incidents of gas/air embolism and recommended that gas/air not be used for cooling the laser fibre tip or for insufflation during intrauterine laser surgery.[36] A liquid distension medium provides adequate visualization and also serves as a cooling agent and would eliminate this problem.[36]

Dextrose

Dextrose 5% is one of the liquid distending media used in operative hysteroscopy. Although it can provide distension as well as clarity, excessive bleeding from the uterine cavity can obstruct visualization. Continuous irrigation can help to overcome this problem by allowing a constant flush through the outflow channel of the operative hysteroscope. Excessive fluid can also escape through a slightly overdilated cervix.

Hyperglycaemia is a potential problem and appears to be proportional to the duration of surgery.[37] The potential for the dilutional hyponatraemia syndrome, similar to that seen during transurethral prostatectomy (TURP) is also present because of the open vessels exposed during hysteroscopic resections and the high distending pressures of the uterus.[24] Nevertheless, dextrose 5% in water appears to be a safe distending medium as any absorbed fluid is redistributed in the total body water and later excreted in the urine. However, when large volumes are involved, 10–20 L over one hour, this may negate the potential benefit. There are no studies documenting the rate of absorption of fluid into the systemic circulation during hysteroscopy.

Attempts to reduce absorption by vasoconstriction with the use of chilled fluids may run the risk of hypothermia[38] and the addition of vasoconstrictors (adrenaline, octapressin) have not been shown to be of benefit but are potentially arrhythmogenic.[38,39]

Any balanced salt solution can be used for intravenous infusion at a maintenance requirement of 1–2 $ml \cdot kg^{-1} \cdot hr^{-1}$. It has been suggested that a blood loss of 500 ml or greater should alert one to reassess the volume status of the patient. It will be useful to measure the haematocrit and haemoglobin as well as electrolytes and blood sugar because blood loss is occult. The volume used for irrigation and the effluent volume should be measured. It has been shown that in prostatic resection that as much as 10–20 ml min^{-1} fluid are absorbed.[24] We think that similar amounts may be absorbed during hysteroscopy. There are no controlled studies to show that the risks are increased if the resection time exceeds one and half hours. However in urological practice, resection time is limited to a maximum of one and a half hours.

Dextran

The third medium is 32% Dextran 70 in dextrose 5% (Hyskon®). Dextran 70 and Dextran 40 (RHEOMACRODEX)® are used in some centres but are not as popular as glycine due to potential complications. Dextran 70 (with an average molecular weight of 70,000) provides excellent visualization, is optically clear with a high refractive index, electrolyte free, nonconductive, nontoxic, and is biodegradable. However, it is antigenic and on rare occasions (1 in 10,000), it can cause anaphylactic reactions.[40,41] Also, it is immiscible with blood and there is a need for immediate cleansing and rinsing of the instruments in hot water to avoid hardening and crystallization of the dextran.

Dextran 40 (average molecular weight 40,000) is not used during hysteroscopy because there is a 3 in 10,000 risk of anaphylactic reactions when given intraperitoneally and a possible direct toxic effect on pulmonary capillaries.[16,17,42,43]

Dextran 40 and Dextran 70 have been implicated in the generation of non-cardiogenic pulmonary oedema as well as of disseminated intravascular coagulation.[44] Dextrans decrease platelet aggregation and heparin potentiates this effect.[20]

With both of these agents the majority of reported adverse reactions relate to the use of Dextran with the occurrence of non-cardiogenic pulmonary oedema (NCPO) secondary to hypervolaemia. In these case reports the diagnosis of hypervolaemia was made on the basis of increased central pressures and a decreased haematocrit in the absence of large blood losses. One millilitre of D70 expands extracellular fluid volume (ECF) by 8.6 ml.[17,18] Absorption is influenced by the volume used, injection pressure and uterine pressure achieved.[17] The risk of pulmonary oedema increases with the administration of Hyskon (D70), when >500 ml is used, if the procedure takes >45 minutes or if the resection involves large areas of traumatized endothelium.[16,23] Limiting uterine pressures to <150 mmHg has also been suggested to minimize leakage through the fallopian tubes to the peritoneal space. Treatment of NCPO should be directed towards maintaining oxygenation and diuresis to reduce the hypervolaemia.

Low molecular weight dextran is a mixture of dextrose polymers with an average molecular weight of 40000 (range 10000–80000). In normal subjects the component with the lowest molecular weight are excreted by the kidneys within 12–24 hours. The largest components may be present in the plasma and the interstitial compartments for weeks. The plasma volume may increase and reduce the haematocrit and protein concentrations. Another potential but fortunately rare complication is acute renal failure. The dextrans are toxic to kidneys inducing vacuolization of the tubular cells. In laboratory animals, dextrans induce oliguric acute renal failure within minutes of its administration.[21] A prerequisite for the clinical development of renal failure is a constriction of renal arterioles.[21] Renal failure is a real risk only to someone with compromised renal function or elderly patients.[16,17,45]

Glycine

One of the most commonly used distending media for operative hysteroscopy is glycine 1.5%. It is an amino acid which is rapidly distributed throughout the extracellular fluid space. Its cellular penetration occurs more rapidly than water or dextrose. About 10% of glycine is excreted in urine which results in a brisk osmotic diuresis. Glycine is metabolized in the liver and has a plasma half-life of 85 min. Metabolism leads to increased plasma concentrations of ammonia, serine and oxalate. Hyperammonaemia can result in toxic reactions such as visual disturbances and muscle weakness.[24,45,46]

Other side effects associated with the use of glycine include heart failure, haemodilution with hyponatraemia, encephalopathy, seizures and GI disturbances such as nausea and vomiting. These occur after a glycine load of 22–35 g (i.e., 15000–35000 ml glycine 1.5%).[30] Reports of central nervous system toxicity including encephalopathy and transient blindness from glycine have been reported in the urological and orthopaedic literature after prostatectomy and arthroscopy.[24] In a case study to determine factors associated with the development of encephalopathy, 65 adults (45 women and 25 men) with postoperative hyponatraemic encephalopathy were compared with a group of 674 adults (367 women and 307 men) with postoperative hyponatraemia but without encephalopathy.[47,48] Of the 34 patients who developed permanent brain damage or died, 33 were women. The arterial PO_2 at the time of diagnosis was considerably lower for women than for men. Furthermore, of the 38 patients who had respiratory arrest before the diagnosis of encephalopathy, 36 were women. The authors of this case study concluded that both men and women were equally likely to develop hyponatraemia and encephalopathy after surgery. However, when encephalopathy develops menstruant women are 25 times more likely to die or develop brain damage.[47,48] Since 1935, more than 260 cases of postoperative hyponatraemia with neurological involvement have been reported in the literature. At least 55 of the 260 cases either died or developed brain damage. Brain damage with hyponatraemia has commonly been related to the magnitude of hyponatraemia and the rapidity of decrease in serum sodium level.[46]

The occurrence of hyponatraemic encephalopathy in women undergoing endometrial ablation may be fatal.[48] In a report of four healthy patients, three of the women were promptly treated with hypertonic saline so that serum sodium concentration increased from 102 to 123 $ml \cdot L^{-1}$ in 24 hr). The fourth patient was not treated until after seizures occurred. The operative procedure was terminated in all the four cases. The three patients who were treated aggressively made a full recovery while the fourth patient suffered respiratory arrest before treatment could be started. The patient recovered consciousness but died several days later. An autopsy revealed cerebral oedema and tonsillar herniation.[47,48]

Sorbitol

A hexitol sugar, sorbitol is initially distributed in the extracellular space followed by uptake in the liver where it is metabolized to fructose and glucose and this can result in hyperglycaemia. Intravasation of sorbitol can result in haemodilution and hyponatraemia with all the associated sequelae. However, no changes in plasma osmolality are noted.[49,50] Sorbitol 2.7% and mannitol 0.54% is available as a mixture (Cytal) for urological procedures but is not popular. The advantage of sorbitol is that it has a short half life of 35 min. Mannitol is essentially inert as well being an osmotic diuretic and theoretically reducing the risk of volume overload. This combination has been used and is still being used in some centres in the United States. Due to sorbitol's short intravascular half life of 35 min when compared with 85 min of glycine, serum osmolarity would decrease more quickly with excessive volume of sorbitol/mannitol mixture than with a comparable amount of glycine.

Mannitol
Mannitol is also a hexitol sugar but it is not metabolized and therefore is excreted unchanged in the urine. As a result, mannitol causes an osmotic diuresis which can be beneficial in helping to decrease the side effects of intravasation. Intravasation, as with other distending media, can cause hypervolaemia with associated haemodilution and hyponatraemia.[49] However, due to the diuretic effect of mannitol, administration of other diuretics is contraindicated when more than 0.5 L of mannitol is absorbed. This can result in severe hypotension.

Technically, mannitol can cause increased visual distortion and crystallization on instruments. This problem can be reduced by using mannitol in combination with other solutes or by using low concentrations (2–3%).[51] However, combination solutions that are available, such as 2.7% sorbitol and 0.54% mannitol (Abbott Laboratories, Chicago, IL) must also be used with caution as this solution can potentially cause dilutional hyponatraemia as well.[52]

Fluid overload

Incidence
The Transurethral Resection Syndrome (TUR) has been described in the urological literature[24,27–29,30,45,46,49,50,56] and is increasingly reported in the gynaecological literature.[9,16,17,19,23,25,26,28,37,40,43,44,47,48,52] The syndrome occurs in 1–7% of resections. Minor symptoms are seen in 10–25% of prostatic resections. The exact incidence of such reactions in gynaecological resections has not been reported. The membership survey of the AAGL in 1988 and 1991 revealed an incidence of fluid overload in 3.4 per 1000 cases in hysteroscopic procedure.[8,9] Others report an incidence of 3–6%.[53] During the 1980s it became apparent that the TUR syndrome may occur not only after prostatectomy but also in connection with other surgical procedures where an electrolyte free irrigating solution is used.

Pathophysiology
The irrigating fluid rapidly enters the blood stream through open veins. The second principal mode of absorption is extravascular via the retroperitoneal route. It has been recommended since the 1950s that urologists should avoid using excessive fluid pressure in order to reduce the absorption.[24] If the minimum pressure (4 kpa) in the prostatic fossa corresponding to a height of 60 cm above the operating table is not exceeded severe vascular absorption will not occur.[24] It was also demonstrated that, when the pressure in the prostatic veins increased, there is an increase in fluid absorption.[24] The irrigant fluid absorbed into the blood stream produces a transient increase in blood volume. The elimination of fluid from the circulation is due to rapid redistribution throughout extracellular space and, to a lesser extent, to osmotic diuresis. During ongoing uptake of irrigating fluid it leaves the extracellular space at a rate of 17–24 $ml \cdot min^{-1}$.[24]

The four principal mechanisms contributing to the pathophysiology of TUR syndrome are:

1 *Circulatory distress from the rapid fluid and electrolyte shifts.* The symptoms of TUR syndrome are inconsistent and tend to appear at different volumes of absorption. Arterial hypertension followed by nausea and vomiting are the most common symptoms that occur and develop at an absorbed volume one to two litres.

  Sudden or gradual onset of hypertension is an early sign of major fluid absorption. This is followed by ECG changes when sodium concentrations decrease to $<120\ mM \cdot L^{-1}$.[44] The ECG changes include bradycardia, loss of atrial activity, nodal rhythm, widened QRS complex, ST-T wave changes and ventricular tachycardia. Some patients complain of retrosternal chest pain after 20–30 min of resection when central venous and arterial pressures are elevated. Therefore, chest pain may be the first symptom of TUR syndrome. Dyspnoea is a common symptom due to accumulation of fluid in the lung. Sometimes a sudden decrease in blood pressure occurs with or without preceding hypertension and often with bradycardia. Following the initial symptoms of TUR syndrome, the patient may develop oliguria and anuria. Other minor symptoms may be a prickling or burning sensation in the arms, face and neck within one minute of absorption of glycine.[24] These symptoms subside within two minutes. Transient blindness with blurred vision may occur which may progress to total blindness. Fundascopic examination is normal but pupillary reflexes may be normal or absent. The vision returns in 4–12 hr.

  Apprehension, nausea, irrational behaviour, confusion may be observed as the first signs of TUR. Grand mal seizures coincide with onset of encephalopathy.[24] Extravascular absorption leads to abdominal pain, swelling of the abdomen.

2 *Adverse effects of glycine.* Glycine is toxic to neural tissue. It produces alteration of ocular retinal potentials, visual disturbance and release of vasopressin. The ocular effects often occur without the other signs

of TUR syndrome.[49–55] The toxic symptoms of malaise, nausea and vomiting follow a glycine load of between 22–35 g. There is often elevation of blood concentrations of ammonia and glutamic acid, but they do not correlate with the clinical signs of TUR syndrome. Also, hyponatraemia is more commonly seen than hyperammonaemia.

3 *Dilutional effects on protein and electrolytes in the body fluid.* Dilution of serum protein concentration lowers the osmotic pressure and increases the uptake of fluid from plasma to interstitial space. Dilutional hypoproteinemia is not likely to produce brain oedema but when it exists with elevated left atrial pressure, pulmonary oedema may ensue. Water intoxication producing an acute decrease in serum sodium <120 $mM \cdot L^{-1}$ is associated with nausea, vomiting, muscle weakness, encephalopathy and seizures. The serum osmolality is often normal early in the syndrome. In association with hyponatraemia, potassium concentrations tend to be higher initially leading to the possibility of hyperkalaemic cardiac arrest.[24]
4 *Sequelae of the disturbance of renal function.* For patients with cardiac or renal risk factors, placement of a central venous line may be prudent to guide fluid management. Measurement of electrical thoracic impedance has been suggested as a means of monitoring the uptake of irrigating fluid. Most recently, the measurement of ethanol in the breath utilizing ethanol tagged glycine (1.5% glycine in 2% ethanol) has been described. Absorption of 100 ml of fluid is equivalent to 0.02 or 0.03 on the breathalyser.[55,56] No cases of ethanol intoxication or increased ammonia have been reported with this technique which has the potential to be a useful monitoring tool.[53,54]

Management

The anaesthetist must be alert for early signs and symptoms of fluid overload. Prevention is better than treatment. The clinical symptoms or picture are easily confused with other medical emergencies. Therefore, measurement of serum sodium should be performed at the least suspicion of this complication. The operation should be terminated and prompt treatment instituted.

Hypertension is usually transient but may be treated with vasodilators. Chest pain usually resolves spontaneously within five to ten minutes. Oxygen, morphine and sublingual nitroglycerine may be useful. Obviously, fluid overload is easier to detect when regional anaesthesia is used. The occasional hypotensive episode in TUR may be treated with colloids, crystalloids and/or vasopressors. Mild hyponatraemia (125–130 $mM \cdot L^{-1}$) may be treated with fluid restriction and diuretics-lasix 10–20 mg *iv*. In severe hyponatraemia (<110–115 $mM \cdot L^{-1}$) the treatment should be slow with infusion of saline 3–5%, 200–500 ml over four hours.[24]

Regional anaesthesia may be advantageous in terms of rapid recognition of symptoms associated with dilutional hyponatraemia. This occurs progressively from restlessness, agitation, nausea and vomiting to visual changes and headaches. General anaesthesia prevents early recognition of these signs and symptoms. Blood pressure changes, pupillary dilatation and changes in oxygen saturation may all be associated with various components of general anaesthesia. Thus, the first recognizable signs may be electrocardiogram changes or pulmonary oedema. Thus, in the high risk patient, regional anaesthesia may be preferable over a general anaesthetic.

Anaesthesia

Hysteroscopy may be performed as an office procedure for diagnostic purposes without anaesthesia, but it is often done under anaesthesia. The patients are prepared as for any surgical procedure by history, physical examination and appropriate laboratory investigation i.e., serum electrolytes and haemoglobin.

Care must be taken in positioning the arms and legs so that they are properly padded in order to avoid neuropathies particularly lateral popliteal and brachial plexus neuropathy.[10,12–24] The choices of anaesthesia are:

1 Local infiltration of para-vaginal tissue with xylocaine 1–2%.
2 Local infiltration with intravenous sedation.
3 Paracervical block.
4 Regional anaesthesia with either epidural or spinal blockade.
5 General anaesthesia.

Various types of anaesthesia have been reported for hysteroscopic procedures. There are no controlled studies comparing different techniques of anaesthesia. Although local anaesthetics, intravenous sedation and paracervical blocks may be adequate for diagnostic hysteroscopy, they are not suitable for more prolonged and complicated operative hysteroscopic procedures. A regional (epidural or spinal) or general anaesthetic would be most suitable for these procedures. Since general anaesthesia may prevent early recognition of the signs and symptoms of dilutional hyponatraemia, regional anaesthesia may be more appropriate in the high risk patients. Monitoring comprises blood pressure measurement, ECG, pulse oximetry, capnometry and temperature. Monitoring sensorium is useful in patients having regional anaesthesia.

General anaesthesia is most commonly employed for anxious patients and also when the procedure is protracted. All hysteroscopic procedures are prepared for possible laparoscopy and laparotomy. It is usual to induce anaesthesia with a barbiturate or propofol and to maintain anaesthesia with a mixture of N_2O, O_2, inhalational agents and muscle relaxants and controlled ventilation. A diagnostic hysteroscopy can be done with a face mask or a laryngeal mask. However, major hysteroscopic resections require tracheal intubation usually with controlled ventilation. The utilization of a major amount of Trendelenberg position may also necessitate endotracheal intubation. As well, the use of a laryngeal mask is contraindicated in obese women or in patients with a history of hiatus hernia with reflux.

In order to minimise the incidence of hyponatraemia, hypothermia and hypervolaemia, the following recommendations are made by the authors.

1 Core body temperature monitoring.
2 Monitoring fluid therapy.
3 Fluid output and input measurements.
4 If a 500 ml deficit noted – electrolytes are measured.
5 If a 1000 ml deficit noted – furosemide 20 mgs administered *iv*, serum electrolytes are measured immediately.
6 If a 2000 ml deficit noted – the procedure is terminated.

Conclusion

Over the past ten years the hysteroscope has established itself as a valuable diagnostic and therapeutic tool. A knowledge of various media is essential for the gynaecologist as well as the anaesthetist to minimise or prevent complications related to the media.

A liquid distending media used in operative hysteroscopy may cause dilutional hyponatraemia which can potentially be fatal. Due to the seriousness of this condition, all precautions must be undertaken both preoperatively and intraoperatively. All personnel involved should be aware of the potential complications and fluid balance should be monitored intraoperatively.

There is the potential for dilutional hyponatraemia with dextrose, water, glucose, mannitol and sorbitol. Dilutional hyponatraemia has to be recognized early and treated promptly in order to avoid further complication. All the personnel in the operating room should be aware of the problem and a fluid flow chart strictly maintained. It will be helpful to monitor the electrolytes if the procedure exceeds one hour and routine monitoring should include BP, ECG, $P_{ET}CO_2$ and oximetry. In high risk patients central venous pressure, pulmonary artery pressure or precordial doppler monitoring have been recommended by some but is not a routine in our centre.

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