GUIDELINES

Assessment, investigation, and early management of head injury: summary of NICE guidance

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This is one of a series of *BMJ* summaries of new guidelines, which are based on the best available evidence; they will highlight important recommendations for clinical practice, especially where uncertainty or controversy exists

Further information about the guidance and the members of the development group are on bmj.com

Why read this?

Head injury is a major public health problem both logistically and clinically. Many patients seek healthcare advice for this, although relatively few will need care in a neuroscience centre. Most will make a good recovery, but the incidence of ensuing disability even after apparently "minor" injury is surprisingly high.

This article summarises the most recent guidance update from the National Institute for Health and Clinical Excellence (NICE) on the appropriate investigation and early care of patients with head injury, where there has been a significant shift from "admit and observe" to "diagnose and decide."[1]

Recommendations

NICE recommendations are based on systematic reviews of best available evidence. When minimal evidence is available, a range of consensus techniques is used to develop recommendations. In this summary, recommendations derived primarily from consensus techniques are indicated with an asterisk (*).

CT imaging of the head in adults

Request computed tomography (CT) brain scan immediately for adult patients with any of the following risk factors:

- Glasgow coma score <13 on initial assessment in the emergency department
- Glasgow coma score <15 two hours after the injury on assessment in the emergency department
- Suspected open or depressed skull fracture
- Any sign of basal skull fracture
- Post-traumatic seizure
- Focal neurological deficit
- One or more episodes of vomiting
- Amnesia for events more than 30 minutes before impact.

CT imaging of the head in children

Request computed tomography of the brain immediately for children with any one of the following risk factors:

- Age over 1 year: Glasgow coma score <14 on assessment in the emergency department
- Age under 1 year: Glasgow coma score paediatric <15 on assessment in the emergency department
- Age under 1 year and presence of bruise, swelling, or laceration (>5 cm) on the head
- Dangerous mechanism of injury
- Clinical suspicion of non-accidental injury
- Loss of consciousness lasting more than five minutes (witnessed)
- Post-traumatic seizure but no history of epilepsy
- Abnormal drowsiness
- Suspected open or depressed skull injury, or tense fontanelle
- Any sign of basal skull fracture
- Focal neurological deficit
- Three or more discrete episodes of vomiting
- Amnesia (antegrade or retrograde) lasting more than five minutes.

Imaging of the cervical spine

The initial investigation of choice for the detection of injuries to the cervical spine remains the plain radiograph, but in the following circumstances computed tomography is now preferred.

In adults and children 10 years or older

Request computed tomography of the cervical spine immediately for patients with the following risk factors:

- Glasgow coma score <13 on initial assessment
- Intubated patients
- Technically inadequate plain film series
- Continued clinical suspicion of injury despite a normal x ray
- Patient is being scanned for multi-region trauma.

In children under 10 years

Because of increased risks associated with irradiation in young children, particularly to the thyroid gland, computed tomography of the cervical spine should only be requested when*:

- A child has a severe head injury (Glasgow coma score ≤8),
- A strong clinical suspicion of injury exists despite normal plain films, or
- Plain films are technically inadequate.

Transport

All patients who have sustained a head injury should

be transported directly to a facility with the necessary resources to resuscitate, investigate, and initially manage multiple injuries. It is expected that all acute hospitals and all neuroscience units accepting patients directly from the incident will have these resources, and that these resources will be appropriate for the patient's age.*

Local guidelines on the interhospital transfer of patients with head injuries should be drawn up between the referring hospital trusts, the neuroscience unit, and the local ambulance service. These should recognise the merit of transferring all patients with serious head injuries (GCS ≤8), irrespective of their need for neurosurgery. However, if transfer of those who do not require neurosurgery is not possible, ongoing liaison with the neuroscience unit regarding clinical management is essential.*

Advice on long term problems and support

Advise all patients and their carers of the possibility of long term symptoms and disabilities after head injury. Information should be provided on support services that they could contact if they experience long term problems.

Overcoming barriers

Although implementation of these guidelines is clearly intended to improve patient care, the sheer number of patients with head injury means that any change in policy may have important effects on the ambulance service, neuroscience centres, and the other work of emergency, intensive care, and radiology departments. Reassuringly, though, the major change advocated in the first NICE head injury guideline—from a policy of admission (with plain skull radiographs being used as a triage tool), to diagnosis through computed tomography—was not as disruptive as many had anticipated and led to improvements with safe early discharge, evidence of a reduction in the numbers of admitted patients and cost savings in some centres.[2] The modest increase in the use of computed tomography for imaging of the cervical spine recommended in this update should be even less disruptive.

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1 National Institute for Health and Clinical Excellence. *Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults.* 2007. (NICE clinical guideline No 56). www.nice.org.uk/CG056
2 Hassan Z, Smith M, Littlewood S, Bouamra O, Hughes D, Biggin C, et al. Head injuries: a study evaluating the impact of the NICE head injury guidelines. *Emerg Med J* 2005;22:845-9.

RATIONAL IMAGING

Uterine artery embolisation to treat uterine fibroids

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This series provides an update on the best use of different imaging methods for common or important clinical presentations. The series editors are Fergus Gleeson, consultant radiologist, Churchill Hospital, Oxford, and Kamini Patel, consultant radiologist, Homerton University Hospital, London

Women may now have another effective, safe, and minimally invasive treatment option for treating fibroids

The patient

A 34 year old woman presented to her gynaecologist with menorrhagia associated with dysmenorrhoea and urinary frequency. She was nulliparous but had been trying to become pregnant for several years.

What is the next investigation?

Transabdominal or transvaginal ultrasound is the most commonly performed imaging test for investigating menorrhagia with dysmenorrhoea or pressure related symptoms. If the results suggest uterine fibroids and uterine artery embolisation is a treatment option, we recommend magnetic resonance imaging with gadolinium (dimeglumine gadopentetate) enhancement (fig 1) because it has advantages before and after treatment (table).[1-3]

Outcome

Imaging confirmed the presence of an enlarged multilobulated fibroid uterus—the largest fibroid was intramural and measured 14.2 cm. Treatment options included:

- Medical treatment (tranexemic acid with or without gonadotrophin analogue)
- Mirena coil
- Endometrial ablation techniques
- Myomectomy
- Hysterectomy
- Uterine artery embolisation
- Magnetic resonance guided focused ultrasound surgery.

Medical management had been tried unsuccessfully and endometrial ablative techniques were not considered appropriate because the fibroids were intramural. Magnetic resonance guided focused ultrasound surgery shows promise,[1] but it is still a research tool with limited availability. The referring gynaecologist thought that the morphology of the fibroids made them unsuitable for myomectomy, and the patient was keen to avoid hysterectomy as she wanted to conceive in the future. Although current advice is that embolisation should be offered only to women who have completed their families,[4] successful pregnancies have been reported after this procedure.[2] The patient's concentrations of follicle stimulating hormone were at the upper limit of normal (7.5 IU/l).

After discussing all options with her gynaecologist and an interventional radiologist, the patient chose to

Comparison of pelvic ultrasound and magnetic resonance imaging (MRI) for uterine pathology

Factor	Ultrasound	MRI
Cost	Relatively cheap	More expensive
Availability	Widely available	Limited resource
First line investigation	Yes[1]	Problem solving[1]
Uses ionising radiation	No	No
Sensitivity for all uterine pathologies	48-100%[1]	—
Specificity for all uterine pathologies	12-100%[1]	—
Diagnosis of pelvic pathologies other than fibroids	89% sensitivity and specificity[1]	89% sensitivity and specificity[1]
Fibroid size, position, and vascularity as a predictor of success	Poor[2]	Excellent[2]
For assessing complications (such as abscess or sloughed fibroid within endometrial cavity)	Poor[2 3]	Excellent[2 3]

undergo uterine artery embolisation, a treatment recommended in current National Institute for Health and Clinical Excellence (NICE) guidelines on heavy menstrual bleeding.[3] She gave fully informed consent, and she accepted the risk of complications, including hysterectomy and fetal growth restriction.

We performed the procedure in the radiology vascular theatre using high quality imaging facilities, under antibiotic cover, and using oral diclofenac and intravenous morphine sulphate via a patient controlled analgesia pump.

We used a unilateral femoral artery approach, and both uterine arteries were selectively catheterised (fig 2). The arteries were then embolised using three vials of 355-500 µm particle polyvinyl alcohol until stasis of contrast occurred (fig 2). The patient was sent home 24 hours after the procedure with oral diclofenac and tramadol as analgesia. Her symptoms improved (fig 3), and at one year follow-up her periods were normal and not painful.

The patient became pregnant about 30 months after the procedure. At 34 weeks she had a lower segment caesarean section because of hypertension and intrauterine growth retardation secondary to oligohydramnios. A 2.1 kg baby boy was born; he had respiratory distress syndrome in the first week, but this quickly resolved.

Currently, the boy is 12 months old, in good health and developmentally normal apart from sensorineural deafness of uncertain cause. The mother is asymptomatic with normal light periods.

Uterine artery embolisation

Uterine artery embolisation is an image guided technique that reduces the blood supply to uterine fibroids, which makes them shrink and become asymptomatic. A small catheter is introduced, usually via the common femoral artery under local anaesthesia. The catheter is manipulated into the uterine arteries on both sides using x ray guidance, and an embolic agent is injected to occlude them. This technique has been performed more than 100 000 times worldwide since it was first described in 1995.[5] Operator experience is important, and most major centres in the United Kingdom have trained radiologists who provide this service. Recently published guidelines support the use of this technique as an alternative to myomectomy and hysterectomy in women with symptomatic fibroids greater than 3 cm in size (box).[3]

Benefits

Around 80-90% of patients will be asymptomatic or have significantly improved symptoms at one year, with an associated 40-75% reduction in fibroid volume. Recent studies support good outcomes at five years. However, 20-25% of patients will need further treatment, including repeat embolisation or surgery (myomectomy or hysterectomy) within five years.[7 8 10]

Patients usually have a shorter stay in hospital (24 hours), faster recovery and return to work (seven to 10 days), and lower rate of major morbidity (such as damage to the bowel or bladder) than those who have a hysterectomy or myomectomy; minor complication rates are similar.[7 8 10] In addition, patients who want to conceive in the future or who have no other conservative treatment option can retain their uterus.

Economic modelling indicates that uterine artery embolisation is a cost effective treatment with significant savings over open surgery at one year.[8] Quality adjusted life year scores increase with the desire for pregnancy and the age of the patient, and older patients are less likely to need reintervention.[2]

Adverse effects

Most patients have pain of varying severity, which can usually be controlled by analgesia. Postembolisation syndrome occurs in up to 52% of patients.[8] This constitutes a general malaise, with mild pyrexia and flu-like symptoms, which is self limiting and usually lasts for seven to 10 days.

A persistent non-offensive discharge (negative on bacterial culture) occurs in 7-14% of cases. It may be more common with submucosal fibroids.[6-8 10]

The risk of hysterectomy and or repeat uterine artery embolisation for treatment failure is around 10% at one

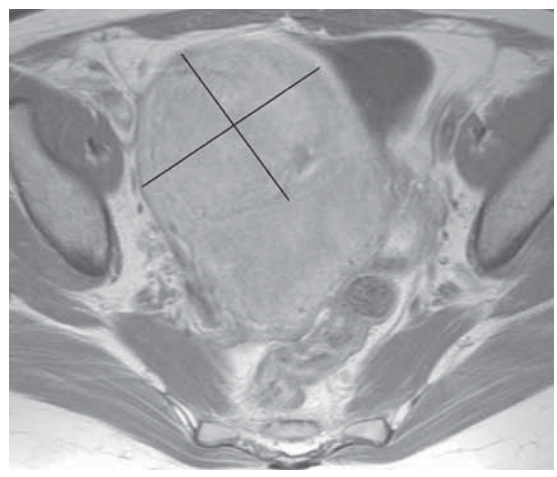

Fig 1 | Gadolinium enhanced axial T1 weighted magnetic resonance imaging of the pelvis before embolisation. The uterus is enlarged, mainly as a result of a 14.2 cm intramural vascular fibroid, which shows pronounced enhancement

LEARNING POINTS

- Uterine artery embolisation is a safe and effective minimally invasive technique for treating symptomatic uterine fibroids
- Recent NICE guidelines support its use as an alternative to myomectomy or hysterectomy in women with symptomatic fibroids larger than 3 cm who wish to preserve fertility
- The risk of hysterectomy or repeat uterine artery embolisation for treatment failure is around 10% at one year and 20-25% within five years
- The risk of hysterectomy for complications is 2.9% at 12 months
- The risk of premature ovarian failure is around 1-2% in most series but increases with age; it can approach 25% in women over 45

year and rises to 20-25% within five years.[7 8] There is also a 2.9% risk of hysterectomy within 12 months as a result of uterine sepsis or uncontrolled pain.[3 7]

The risk of premature ovarian failure is around 1-2% in most series. However, this risk increases with age, and it can be as high as 25% in women over 45.[7] If the patient becomes pregnant, there is a theoretical risk of uterine rupture or intrauterine growth retardation. The miscarriage rate is also 40-70% higher than in an age matched population.[2 7] Late expulsion of a fibroid can also occur in 2.2-7.7% of cases.[6-8]

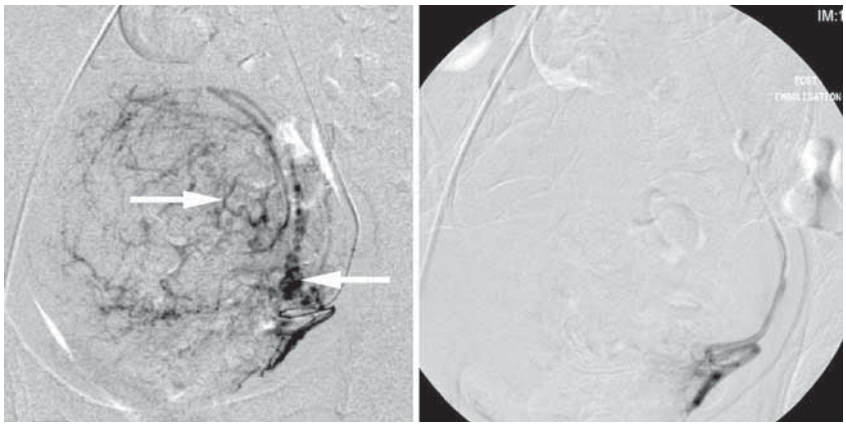

Fig 2 | **Left: pre-embolisation angiography performed from the right groin via a selective catheter in the left uterine artery shows the typical vascular appearances of the hypertrophied arteries supplying the uterine fibroid (arrows). Right: angiography after embolisation with polyvinyl alcohol shows contrast stasis, with no distal flow to the fibroid**

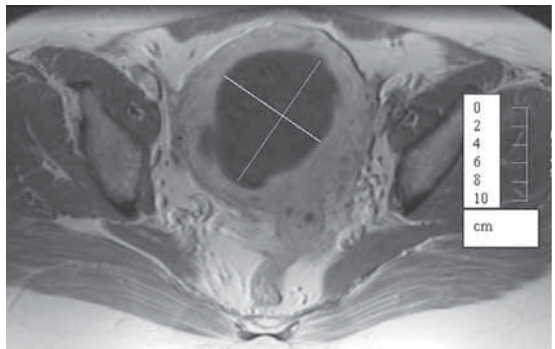

Fig 3 | **Gadolinium enhanced axial T1 weighted magnetic resonance imaging of the pelvis two months after the procedure. The fibroid is greatly reduced in size and is not contrast enhanced, as it is avascular**

Indications and contraindications for uterine artery embolisation[3 5-11]

Accepted indications (strong evidence base)
- Menorrhagia
- Dysmenorrhoea
- Pressure symptoms including abdominal bloating, frequency, nocturia, and constipation

Controversial indications (weak evidence base)
- Asymptomatic patients
- Failure to conceive and all other treatments for fibroids have failed or are not indicated
- Adenomyosis

Contraindications
- Subserosal and submucosal fibroids on a narrow stalk are a relative contraindication because they could detach after infarction and lie free in the retroperitoneum or uterine cavity, where they might become infected. Although no evidence exists to support this hypothesis, it seems sensible to avoid the procedure for such fibroids
- The desire to avoid hysterectomy under any circumstances is an absolute contraindication as there is a small risk of hysterectomy as a result of uterine sepsis or uncontrolled pain after the procedure (2.9% at 12 months)[7 10]

The risk related to radiation is small. Operators are encouraged to use pulsed fluoroscopy and minimise angiographic runs to keep the dose of radiation low. Studies have shown that skin injuries are unlikely, ovarian doses are below the threshold for permanent or temporary sterility, and that the stochastic risk for radiation induced cancer and genetic injury to future children is not substantial.[11]

Questions for further research

Despite the successful pregnancy in this case, it is unclear what advice to give patients about future pregnancy. Many successful pregnancies have been reported, but rates of miscarriage, caesarean section, and preterm delivery are higher than in age matched women without fibroids. A randomised trial comparing uterine artery embolisation and myomectomy with pregnancy outcome as the primary endpoint would be valuable, as would more research into the effect of uterine artery embolisation on ovarian function and long term fertility.

Many technical problems are yet to be resolved, including the ideal embolic agent, the efficacy of single dose antibiotics, and patient selection as an indicator of success. In addition, NICE has called for further research into the psychosexual impact of uterine artery embolisation and myomectomy, the effect of uterine artery embolisation on uterine blood flow, and how uterine artery embolisation reduces heavy menstrual bleeding.

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