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The treatment of appendicitis should be standardised

PERSPECTIVES

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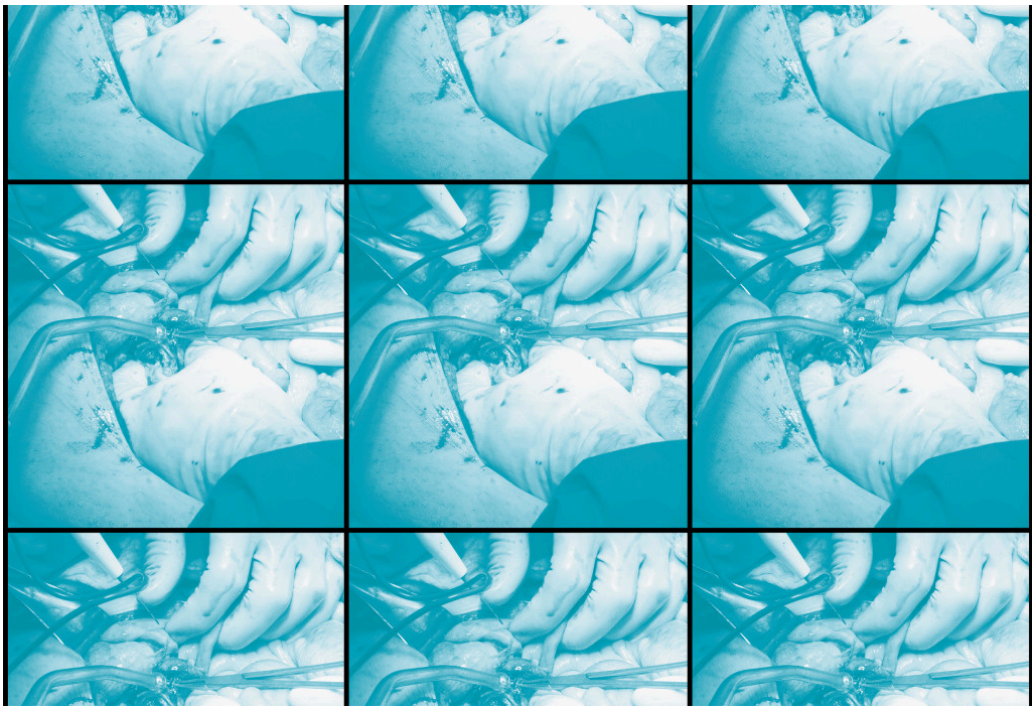
Routine practices for the diagnostic investigation and treatment of acute appendicitis seem to vary between hospitals. We propose working towards a joint strategy for the diagnostic investigation and treatment of acute appendicitis in Norway, on the basis of updated international recommendations and experiences from Norwegian hospitals.



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In Norway, there are no national guidelines for the management of acute appendicitis, and routine practice varies between hospitals. In this 'Perspectives' article, we propose a strategy for diagnostic investigation and treatment, adapted to the situation in Norway. The strategy is based on international recommendations and on experiences from a wide range of large and small hospitals in Norway. The article is intended to be a contribution to the wider discussion about consensus-based national recommendations.

> ***«The article is intended to be a contribution to the wider discussion about consensus-based national recommendations»***

Acute appendicitis is common around the world, but approaches to diagnostic investigation and treatment vary between institutions and regions (1–3). The European Association for Endoscopic Surgery (EAES) and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) have produced recommendations about the management of acute appendicitis (4, 5). The World Society of Emergency Surgery (WSES) has tried to develop standardised guidelines for the diagnostic investigation and treatment of acute appendicitis in a consensus report (6). These are complex with a weak evidence base, but they seem to be based on the best available knowledge. However, there is extensive debate about certain principles in the surgical community, with significant differences in practice between countries. For example, the use of diagnostic imaging continues to be controversial and widely debated (7).

Diagnostic investigation of acute appendicitis

The clinical diagnostic investigation of suspected acute appendicitis is difficult. The condition has differing symptoms and varying clinical findings, and there are a number of differential diagnoses to take into consideration. Scoring tools are used for diagnosis, but none of these are widely used in daily practice (8). Several of the scoring tools have high sensitivity but low specificity. Use of scoring tools may help identify patients at low risk of appendicitis who are best managed with continued observation (9).

> ***«In international studies, the percentage of patients referred for CT for suspected appendicitis varies from 10 % to 95 %»***

Diagnostic imaging with the use of both ultrasound and computed tomography (CT) has become increasingly important to varying degrees. In international studies, the percentage of patients referred for CT for suspected appendicitis varies from 10 % to 95 %. There is a similar variation in the use of abdominal ultrasound (9). The diagnostic value of ultrasound depends on factors specific to both the patient and the radiologist, and there are considerable variations in the sensitivity and specificity for acute appendicitis. There is a high rate of inconclusive examinations, and a normal appendix is reported in around half of examinations even when the patient does have appendicitis (10). Nevertheless, the World Society of Emergency Surgery recommends routine ultrasound ahead of CT if the radiologist has sufficient experience in this type of diagnostic investigation of the condition (6).

Benefits and drawbacks

The absence of radiation exposure is a benefit of ultrasound. However, there is variable availability and experience with this diagnostic investigation of appendicitis in the out-of-hours duty shifts in Norwegian hospitals. Therefore, when drawing up guidelines that include routine ultrasound ahead of potential CT, account should be taken of available local resources to avoid delays in treatment. Many institutions, particularly in Japan and the United States, perform CT routinely in cases of suspected appendicitis (1, 11). This reduces the percentage of negative appendectomies from 10–19 % to 2.5–5 % (1, 11).

Diagnostic CT scans might also elucidate a number of other differential diagnoses. However, although CT has been shown to have high specificity and sensitivity, it will also produce a certain number of false negative and false positive cases (12). Furthermore, routine preoperative CT scanning may increase the risk of cancer development due to radiation exposure, even with the use of low-dose CT. However, the significance of this increased risk with modern CT scans is uncertain (13).

In Norway, a largely selective approach is practised towards preoperative diagnostic imaging in suspected appendicitis. CT scanning is often preferable in older patients. The incidence of malignancy in the large intestine and appendix increases with age, particularly after the age of 40–50 years, and malignancy in the appendix or caecum can present as appendicitis (14). The frequency of complicated appendicitis (i.e. gangrenous appendicitis, perforation or abscess formation) is also higher in older patients (1, 6). Therefore, diagnostic CT scans in this age group might help reveal other conditions and complicating factors, which will guide the treatment strategy.

Ultrasound may be a good alternative to CT in children and slim adolescents, particularly to distinguish appendicitis from a differential diagnosis of mesenteric lymphadenitis, which is a common diagnosis in this younger patient group (15). This group, along with pregnant women, is also more vulnerable to radiation, which clinicians must take into account when selecting a diagnostic approach (16). Box 1 shows the proposed pragmatic approach to the diagnostic investigation of suspected acute appendicitis.

Box 1 Proposed diagnostic investigation of suspected acute appendicitis

- Patients with typical clinical findings and aged <40 years should be taken for immediate appendectomy, preferably laparoscopic.
- Pregnancy should be ruled out in women of child-bearing age (e.g. ectopic pregnancy), and ultrasound and/or gynaecological examination should be considered before any laparoscopy.
- In cases of atypical symptoms, uncertain diagnosis or suspected complicated appendicitis (infiltrate with or without abscess), and cases with a history of symptoms for more than three days, consideration should be given to preoperative CT (adults) or ultrasound (children and slim adolescents). Ultrasound can also be considered in adults who are of normal weight or underweight aged <40 years if sufficient experience and expertise with diagnostic ultrasound scanning for appendicitis is available.
- In pregnant women with suspected acute appendicitis, the threshold for gynaecological examination and ultrasound prior to surgery should be low, unless the case history and clinical findings are unambiguous (delayed treatment may lead to appendiceal perforation, with an associated risk of miscarriage). MRI or low-dose CT may be appropriate in some cases.
- For patients aged ≥ 40 years, CT should be considered prior to surgery due to a higher incidence of neoplasms and complicated appendicitis.

Uncomplicated appendicitis

Surgery has been the standard treatment for acute appendicitis for over 100 years. There are obvious advantages to treatment with a laparoscopic technique (4–6). In general, laparoscopic appendectomy is technically straightforward to

perform and should be the first-line treatment. Open appendectomy is still used routinely at some institutions internationally, although there is a clear tendency towards limiting its use to specific cases (1, 2, 8).

> *«It is not clear-cut whether patients should be offered antibiotic monotherapy treatment as an alternative»*

Antibiotic monotherapy treatment has emerged as an alternative in the last decade. Systematic reviews and meta-analyses of randomised studies have concluded that the majority of patients with uncomplicated acute appendicitis can be treated with an antibiotic-first approach (17), but the studies also show that the rate of recurrence is approximately 40 % after five years (18). Therefore, it is not clear-cut whether patients should be offered antibiotic monotherapy treatment as an alternative (19). It is uncertain to what extent antibiotic monotherapy treatment is used in practice at Norwegian hospitals currently.

Non-surgical treatment of complicated appendicitis

Colonoscopy to the caecum or CT colonography after 6–8 weeks is recommended for patients aged ≥ 40 years treated for appendicitis without surgery to rule out malignancy (6, 20). Conservative treatment with antibiotics, sometimes in combination with drainage, is recommended by many as a low-risk alternative in cases with illness lasting more than three days, due to possible infiltrate formation with or without abscess (21). However, randomised data show that laparoscopic treatment in these cases leads to shorter recovery times where there is the surgical expertise to manage more complicated conditions (22).

The World Society of Emergency Surgery, the European Association for Endoscopic Surgery and the Society of American Gastrointestinal and Endoscopic Surgeons all recommend appendectomy if there are persistent symptoms or a clinical suspicion of appendicitis, even if no appendiceal inflammation is visually evident during surgery, in the absence of any other perioperative findings to explain the symptoms (4–6, 23). Macroscopic assessment of the appendix may be uncertain, and a normal-looking appendix left in situ may carry a risk of repeat surgery, subsequent acute appendicitis or missed malignancy (24).

Conclusion

Acute appendicitis is still a clinical challenge for doctors, both in the primary care sector and in hospitals. Management of the condition varies, and little is known about practice in Norway. For this common acute surgical condition,

joint guidelines for diagnostic investigation and treatment may lead to better use of resources and patient experience across hospitals. We should work on this together.

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