Anal endosonography in faecal incontinence

The application of neurophysiological techniques to the pelvic floor highlighted the role of nerve damage in idiopathic faecal incontinence, and electromyographic needle mapping provided a means of defining traumatic defects in the external sphincter. Internal sphincter damage could be inferred only from manometric assessment, as prior to endosonography there was no means to assess this part of the sphincter directly. The technical advantage of endosonography is that it places the probe within the anal canal, very close to the target structures. High frequency transducers may then be used with the benefit of improved tissue resolution and detail in the near field. Endosonography overcomes the inherent sonographic trade off between high frequency and poor tissue penetration.

The technique of anal endosonography

Endosonography within the anal canal was developed by adapting an endoprobe system designed for rectal examination. Replacing the balloon system for the rectum with a hard cone to cover the rotating probe, was all that was required to obtain highly detailed images of the sphincters. The cone has parallel walls so that the anatomical configuration of the anus is not distorted, and is only 1.7 cm in diameter. An endosonographic examination is easy to perform, requires no preparation of the patient and causes minimal discomfort.

Interpreting the image

A sonographic image is based on acoustic reflections from interfaces of different impedance. The echogenicity of any tissue structure is usually expressed in terms of its overall echogenicity, homogeneity, and textural pattern. Our understanding of the normal sonographic anatomy of the anal canal has been acquired over the past few years. Although this may still be incomplete, a working pattern of the sphincter anatomy has emerged.

The internal sphincter is a clearly defined inner hypo-
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and suggested that the ratio between the thickness of the external and internal sphincters was significantly reduced in patients with neurogenic incontinence.

Endosonography of sphincter disruption
Any break in the ring of the internal sphincter is abnormal, and easily recognised on endosonography. Examination of patients after lateral internal anal sphincterotomy has confirmed that sonographic defects correspond to the site of surgical division.13 After anal dilatation or stretch procedures there may be multiple defects or fragmentation of the sphincter14 (Fig 1). A number of studies have confirmed a fall in resting pressure with internal sphincter disruption.15 16

External sphincter defects (Fig 2) are more difficult to recognise. Traumatic tearing of striated muscle heals by granulation tissue and fibrosis leaving a scar. Acoustically such scars tend to be comparatively homogeneous and of lower echogenicity than the longitudinal muscle and female external sphincter. Such endosonographic lesions have been correlated with electromyographic defects,17-19 and with surgically confirmed muscle tears,20 confirming that these sonographic defects are true scars. A linear relation has been shown between the circumferential length of the defect and the reduction in squeeze pressure.15

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Childbirth is the commonest cause of damage to the anal sphincters (Fig 3). Clinically recognised tears of the external sphincter, by definition third degree, are uncommon with an incidence of <1%. However, endosonography has shown a much higher incidence of sphincter damage. In a prospective study with pre and post-partum scanning, 35% of primiparous women were found to have developed sphincter defects after vaginal delivery.21 In 16% the internal sphincter only was affected, in 6% the external, and in 13% both sphincters were affected. These ‘occult’ defects were not entirely asymptomatic, as on

![Figure 2: There is a well defined anterior defect in the external sphincter (arrows) after a penetrating injury during a road traffic accident.](image)

![Figure 3: Internal and external sphincter defects in the right anterior quadrant (arrows) after obstetric trauma with forceps delivery.](image)

![Figure 4: This 25 year old woman had been rendered totally incontinent after lateral internal anal sphincterotomy. As well as the internal sphincter being cut throughout its length, the external sphincter was also divided (arrows).](image)

![Figure 5: An anterior repair with good functional result. There is no defect between the overlapped ends (arrow).](image)
direct questioning 10% admitted to some disturbance of anal continence. This was associated with sphincter damage, and not with any prolongation of the pudendal nerve motor conduction time.

A damaged sphincter may precipitate overt symptoms later in middle age when the cumulative effects of the menopause, neuropathy, and muscle loss lead to overt decompensation of the continence mechanism. Several studies support this view. In one review of 62 women with faecal incontinence, whose only common history was obstetric trauma, 90% had external and 65% had internal sphincter defects. 22 Another study found that 87% of women with faecal incontinence had a sphincter defect on endosonography. 23 Another report 24 highlighted the significance of childbirth in the aetiology of faecal incontinence, and made a plea for prevention.

Endosonography has made a contribution to the prevention of incontinence by showing exactly what procedures are associated with sphincter damage. Manual dilatation of the anus during anaesthesia is comparatively uncontrolled, and the internal sphincter may be damaged 28 in more than half the patients undergoing such stretch procedures. In 32 consecutive cases sphincter defects were found in 65% with some degree of anal incontinence in 12-5%. 25 The alternative procedure of lateral internal anal sphincterotomy, though more precise is not without risk (Fig 4). The operative objective is to divide the distal third of the internal sphincter up to the level of the dentate line. Endosonography has shown that this is achieved in most but in women the shorter anal canal may result in a more extensive sphincterotomy than intended. In nine of 10 women it was found that the entire length of the internal sphincter has been divided, 13 and three of these patients were incontinent to flatus. Endosonography has shown that vacuum extraction is safer than forceps with regard to sphincter damage. 26

Examination after primary repair of third degree tears suggests that many have residual sphincter defects, 27 28 which are associated with low anal resting pressures, and symptoms when both internal and external sphincter defects are present. Good functional outcome from a surgical repair correlates with restoration of an intact external sphincter ring (Fig 5), and conversely poor function with persisting defect. 29 30

Conclusion

Many studies have confirmed the value of endosonography for detecting sphincter damage in faecal incontinence. 8 15 16 19 31 It has been suggested 32 that endosonography replaces electromyographic mapping of external sphincter defects. With experience this is possible, though a combined approach is recommended during any learning curve.

Magnetic resonance imaging has been compared with endosonography. Although a linear correlation was found between the internal sphincter measurements, the anatomical resolution was inferior to endosonography. 32 This situation may change with the development of internal coils for anal magnetic resonance imaging. 33 However, endosonography is much quicker and cheaper than magnetic resonance imaging. It has proved a simple but elegant technique to portray sphincter anatomy. Endosonography complements physiological studies, and is an ideal screening tool in faecal incontinence to select those patients with sphincter damage, who might benefit from surgical repair.

References