Are all babies born in the same way?

Are all babies born in the same way? Some come into this world in a natural way, some through Cesarean section, some with the help of episiotomy, “the unkindest cut of all”, performed with scissors, obliquely and tangential to the anal sphincter, to widen the way. This is a very controversial intervention whose negative effects are described in 40 years of scientific literature. Because of its long term consequences it is recommended, by the World Health Organization, only in emergencies (less than 5% of the cases). This percentage is 5-20% in Northern Europe and USA but skyrockets in the Mediterranean Countries to a swelling 50-60% with peaks of 90% in some maternity centers.

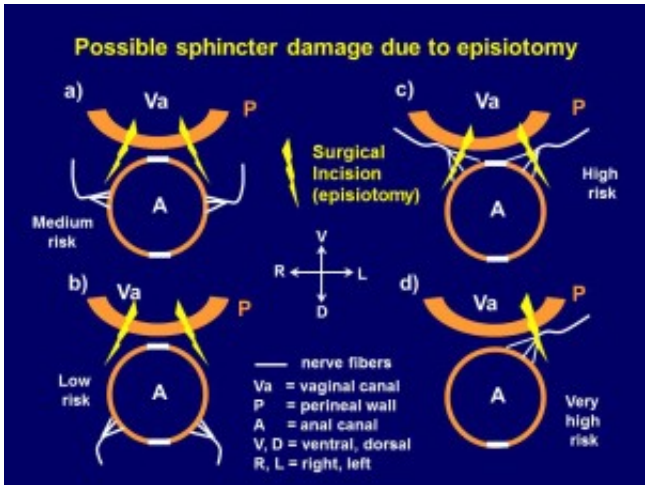

Fig 1. Schematic diagram of episiotomy and possible damage to the anal sphincter innervation.

The motor units of the sphincter (basic muscle bundles of fibers innervated by the same motor neuron in a region called the “innervation zone”) cover different arcs of the circumference and are innervated differently in different individuals so that no two sphincters are identical. Figure 1 depicts four (of the many) different innervation arrangements leading to different consequences when episiotomy is performed. Motor neurons connecting to the muscle fibers are thinner than a hair and cannot be seen by the naked eye of the obstetrician. Case a): right and left sphincter innervation pattern which may be damaged by long cuts. Case b): posterior innervation, unlikely to be damaged by episiotomy. An anterior and bilateral pattern of sphincter innervation is depicted in case c) where innervation damage is very likely. Since most obstetricians are right handed, right side episiotomy is much more common than left and therefore the right-ventral quadrant of the sphincter is mostly affected. Case d) is uncommon and shows a single innervation region in the ventral part of the sphincter, either on the right or left. Damaging this single innervation region may cause immediate incontinence. Case a) and c) usually do not lead to immediate incontinence but the weakened sphincter likely becomes incontinent with age. For this and other gender-related

reasons, fecal incontinence is ten times more common in women than in men, prevents female healthy aging and disrupts quality of life.

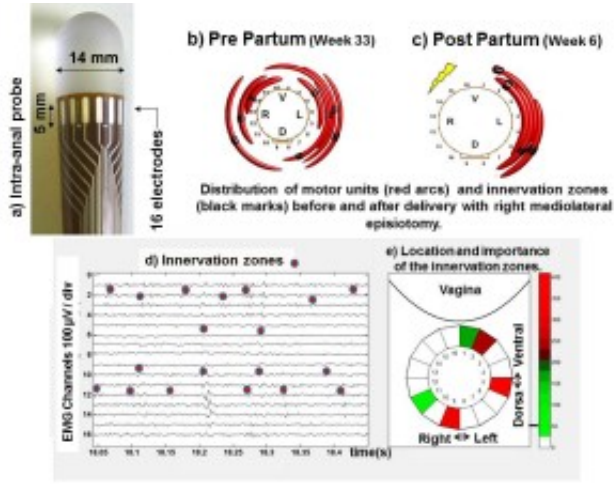

Fig. 2. a) intra-anal probe for detecting anal sphincter innervation. b,c) example of anal sphincter structure before and after child delivery with episiotomy, d,e) example of sphincter EMG signals and color map of innervation distribution: red-brown: important innervations, high risk of damage; green: moderate innervation, medium risk of damage; white: no innervation, low risk of damage.

How can this be reduced? Limiting the practice of episiotomy to emergency cases is the obvious answer but in some Countries this is not accepted because it makes labor longer and may increase the number of lacerations which are more difficult to suture (but usually less dangerous). The next best is to know where the dominant innervation is and avoid cutting it if episiotomy would be deemed necessary at the moment of delivery. This has been the goal of a European and an Italian Project. The solution is a screening applied, during or even before pregnancy, to identify the geometrical distribution of innervation zones around the sphincter. The disposable probe depicted in Fig 2a is introduced in the anal canal for about 2cm. Its 16 electrodes read the EMG signals around the circumference and a suitable software identifies the main motor units and their innervation zones (Fig. 2b and c), displays the EMG signals (Fig. 2d) and provides indications about the risk of cutting on the right or left side (Fig. 2e).

A multicenter study carried out on 350 women (87 episiotomies) demonstrated a major effect of episiotomy on the innervation of the Right-Ventral quadrant of the sphincter. One representative case is depicted in Fig. 2b and c.

In addition to planning episiotomies, the same instrumentation can be used to provide biofeedback in training or re-training the sphincter as well as in forensic and legal medicine.

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Publication

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