Pelvic floor defects are a frequent pathology, causing dysfunctions severe enough to require surgery in one out of ten affected women. DeLancey in his study published in the American Journal of Obstetrics and Gynecology in 2005 states that in the United States a prevention rate of 25% could save 90,000 women each year from experiencing pelvic floor dysfunction.

While vaginal delivery has been established as the most important risk factor of pelvic floor dysfunction, levator ani muscle (LAM) damage is not the only factor associated with this pathology. Other lesions may predispose the development of pelvic floor dysfunction, such as nerve or ligament damage, which may cause impairment of the different pelvic compartments. The failure to detect the lesions that occur during vaginal delivery has hampered prevention and treatment of pelvic floor defects. This is currently changing thanks to electromyography studies, functional evaluation of the pelvic floor and the advent of ultrasound and magnetic resonance imaging (MRI) of pelvic floor muscles.

Transperineal ultrasound studies determined a prevalence of lesions in the LAM of 13% to 36%. Delivery by forceps is one of the most important risk factors for the occurrence of these lesions. Research indicates that LAM avulsions are present in 35% to 64% of all women who have had a forceps delivery.

Acute levator ani muscle lesions can be diagnosed clinically by direct visualization and digital examination when levator avulsion is associated with a large vaginal tear. Technological advances have made 3D ultrasound available as a diagnostic tool. This modality is less expensive and more widely available than MRI and provides real-time images. Furthermore, 3D ultrasound offers the possibility to obtain multiplanar images, allowing the visualization of the pubovisceral muscle in different planes in the same way as MRI.

Previously, pelvic floor ultrasound was limited to the mid-sagittal plane (Fig. 1). The introduction of 3D and 4D images in real time however allows the visualization of the axial plane (Fig. 2) for the morphological analysis of the levator ani muscle and the urogenital hiatus. 3D/4D images are obtained with the same technique as 2D images. A transducer with a recommended capture angle of 85° is recommended in order be able to capture the levator hiatus completely. All three orthogonal images are complemented by a rendered image, i.e. a representation of all semitransparent voxels obtained from a definable box (Fig. 3).

The mid-sagittal image includes the pubic symphysis in front, the urethra and bladder neck, vagina, cervix, rectum and anal canal. Behind the anorectal junction, a hyperechogenic area indicates the
central part of the levator plate, i.e. the pubo-
rectalis/pubococcygeus or pubovisceral muscle
(Fig. 1). To avoid false negatives, the pressure
exerted by the transducer on the perineum should
be as soft as possible in order to allow full
descent of the pelvic organ and the visualization
of existing defects.

Levator avulsion is defined as the detachment
of muscle from the pubis lower branch and the
pelvic wall (Fig. 4a and Fig. 4b). LAM damage
however can occur in any part of the muscle.

Muscle avulsion is a consequence of excessive
stretching of the levator ani during the second
stage of labor.

In most papers the levator ani muscle is shown
using a single axial plane cut. Since the pubo-
rectalis muscle has a curved shape, with its angle
located at the perineal body level a single plane
image however may lead to an incorrect analysis.
Hence the importance of multiview studies. Using
multiple axial slices at intervals of 2.5 mm
(corresponding to 5 mm in caudal direction and
12.5 mm in cranial direction to the plane of
minimal dimensions, making a total of 8 axial cuts)
has been described in many papers, and is
currently considered a useful tool for the diagnosis
of avulsions (Fig. 5a and Fig. 5b).

**Conclusion**

Our study group has been able to demonstrate
that 3D/4D transperineal ultrasound is a useful
tool to diagnose LAM avulsion which allows the
early introduction of a prevention strategy with the
aim to reduce possible future pelvic floor defects.