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THE ROUND MESH IN ABDOMINAL WALL SURGERY. (RATIONALE AND TECHNICAL DETAILS OF AN ORIGINAL DORSO-VENTRAL PHYSIOLOGICAL RESTORATION)

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ABSTRACT

The Authors describe a new "functional" surgical technique of abdominal wall problems, named "round mesh".

The rationale of the procedure is to connect the anterior and posterior trunk muscle compartment with a purposely built polypropylene mesh; the mesh encloses a belt that is shifted posteriorly across the spine in the subcute using a suitable diposable introducer.

Technical details and case presentation, with specific references to the cosmetic and functional outcomes are discussed

Key words: Abdominoplasty, Abdominal wall reconstruction, Dorsal and ventral muscles, Round mesh.

INTRODUCTION

The abdominal wall along the human life, develops very often surgical problems related to weakening of ventral muscles whose aetiology is quite different; congenital and acquired multiple factors (like ageing, marked weight loss, dorso-lumbar neuropathy, surgical scars, increased intraabdominal pressure) are very often involved at the same time.

Whenever large hernia or laparocele, have to be reduced, especially if recti muscles dyastasis is evident) the surgeon faces the task to strengthen the abdominal wall using a synthetic usually not absorbable mesh either buried in the retromuscular, preperitoneal space, or fixed over the ventral fascia with a series of stitches.

Recti and lateral muscles are selectively plicated or shifted on the midline with different procedures to tighten the trunk circumference, accordingly with DiBello and Moore[1], Ramirez[2], Nahas[3].

The combination of muscle plastic procedure and overlying mesh is a further option, but the principle to thicken the anterior circumference adding a further artificial layer without any anchorage offers a passive diaphragm to hernia relapse, just stiffening the abdominal wall without correcting the deformity of the profile.

Our technique aims eventually after linea alba closure, or laparocele reduction, if required, at enveloping both the ventral and dorsal muscle compartment by means of a suitable polypropylene mesh designed in shape of posterior (5 cm high 25-35 cm long) belt that is secured subcutaneously across the spine and the dorsal muscles; the belt is prolonged, on both sides, with two wider wings (20-30 cm high 40-80 cm long), that are crossed over the abdominal fascia on the midline and fixed to the ilio-pubic periostium.

With the ROUND MESH we thus obtain a circumferential reinforcement of thoraco-lumbo-abdominal fascia, that solidarizes all the trunk muscles at the same time allowing a better synergistic tonic and phasic function to anterior and posterior compartment.

ROUND MESH TECHNIQUE

Under general anaesthesia in supine position, with the dorsum and sacrum 12 cm uplifted above the bed plan, we create a bridge across the spine in the lumbar area to simplify the posterior mesh introduction.

The skin incision is performed either on the midline or intertrochanteric (as in cosmetic abdominoplasty): wide exposure of the bare abdominal fascia with careful haemostasis is achieved, followed by laparocele or hernia reduction, and recti muscles plication on the midline eventually. Lateral tunnelization on both sides is performed with the cautery, to extend the mesh without fold on the flanks.

The round mesh is now prepared by the scrub nurse: it is basically a 5 cm high, 30 cm long polypropylene belt expanding bilaterally in two identical 30 cm high, 40-60 cm long segments (Figure 1A). It is carefullly folded and partially inserted into the introducer, an hollow smooth and semiflexible plastic rod 60 cmnlong and 1,5cm in

diameter provided with a conic shaped removable tip (Figure 1B). To the opposite end part of the mesh exits like a flooating tail.

A stab incision is then done on one flank 2 cm above the iliac bone (Figure 1C) and the introducer is inserted subcutaneously, and advanced carefully across the spine, 4^{th}–5^{th} lumbar space, along the transversal tunnel available over the bridged back of the patient. With very delicate and smooth movements the tip is delivered on the opposite flank slipping over the fascia (Figure 1D), and recovered by the surgeon's hand with gentle traction.

At this time an accurate check is done of any blood into the tunnel due to inadvertent vessel tearing during the blind manoeuvre. Coagulation and pressure-control of any belleding spot is easily achieved.

The mesh segment in the contro-lateral area is delivered over the incised flank and the two rectangular terminal segments of the round mesh are crossed ventrally on the midline, leaving the space, to the umbilical stalk exit for skin anastomosis.

The round mesh final length is adjusted cutting it's ends (Figure 1E), before fixing them to the pubo-iliac periostium under moderate tension with 0-prolene atraumatic stitches (Figure 1F).

Two suction drainages are now inserted, one for the ventral area, the other for the posterior tunnel exiting through a pursetring suture the skin hole incised for the introducer. They are left in place as long as the exudate output drops to 30-50 ml, usually around the 5^{th} postoperative day.

Dermolipectomy and three-layers skin suture fullfill the operation that usually lasts no more than 2 and half hours.

Moderate elastocompressive dressing is mandatory to reduce the lymph discharge. Antibiotic-antiinflammatory and analgesic schedule (cefazolin 2 gr/die, tramadole 100 mg x 3 and ketoprophen 100 mg x 2) is administered for 72 hours.

Respiration excercises and early mobilization are part of the protocol, as well as low molecular weight heparin prophylaxis prolonged for 3 weeks.

Discharge from the hospital is usually between the 5^{th} and the 8^{th} postoperative day.

THE OUTCOME

No mortality or major morbility is described in our 155 case series,(120 females aged between 32 and 75 and 35 males aged between 47 and 63); namely, no haemorrages or exceeding lymphorrea, no prosthesis infection, respiratory failure, or thromboembolic disease. Two cases of partial skin necrosis of the wound flap who required medications and healed in one and three months respectively.

Cosmetic and functional results were judged by independent doctors and by the patients at the end of the follow up, comparing the final outcome with preoperative pictures, and preoperative records with physical tests.

As to cosmetic results they were judged excellent by doctors (84%) and patients (75%), good by doctors (12%) and patients (16%), fair by doctors (2%) and patients (7%), poor by doctors (2%) and patients (2 %).

As to the functional results they were evaluated excellent 78% (doctors) and 82% (patients), good 15% (doctors) and 8% (patients), fair 5% (doctors) and 6% (patients), poor 2% (doctors) and 4% (patients).

There were three cases of weight increase (3,5 and 7 kilos respectively), but the fat was mainly stored in the subcutaneous tissue of the trunk, dorsum and thorax without any problem to the round mesh.

The majority of the patients complied with the diet and behavioural prescription, and most of them acknowledged that the round mesh operation had tightened the abdominal extensibility, thus preventing overfeeding and gastrectasia.

FINAL COMMENT

The round mesh technique is a reconstructive procedure for abdominal wall eventration, laparocele, hernias or muscle hypotonia (recti muscles dyastasis), usually joined with lumbar hyperlordosis, and lumbar or lumbo-sciatic symptoms. It can be applied also during cosmetic abdominoplasty, especially in the cases where forward belly protrusion is one of the main patient's complains.

The rationale of the "ROUND MESH" has been recently supported by several Authors[4-8] who have stressed the positive ergonomic role of an abdominal orthopaedic belt in supporting the trunk muscles in stabilizing the sacroiliac joints and spine erector muscles, when standing and straining.

In fact, the ventral and dorsal muscles have been demonstrated to act synergistically during physical exercise (Hodges and Richardson[9], Snijders et al.[10], Souza et al.[11]) and the polypropylene round mesh enveloping both the anterior and posterior compartment, gives a better ergonomic compliance to the muscle-fascial layer of the trunk.

A few literature contributions (Toranto, 1990[12]; Marques et al, 1995[13]; Ramirez, 2000[2]) describe back symptoms improvement after simple abdominoplasty. Specifically Toranto[12] performed first a wide abdominal rectal plication technique with the purpose to increase the intraabdominal pressure thus

improving the spine stability: in his experience 24 of 25 patients had pain relief, with few side effects.

We chose to obviate to the strong tensive closure and abdominal hypertension of this method, with a surrounding round mesh that overlaps circumferentially to the thoraco-lumbo-abdominal fascia, and solidarizes the spine erecting muscle with oblique and transverse ones- under moderate tension.

The criss-cross mesh stitching on the pubo-iliac periostium is an effective spine-stabilizing method.

The operation is simple and quick to be performed. The posterior introduction of the mesh, by means of a suitable introducer is achieved without vessel, or nerve damage. The belt is well extended and strongly supports the apron-like ventral mesh segments and the intraabdominal pressure especially during strains.

No excess of lymph discharge due to fascia overlapping with polypropylene has ever been observed and collagen reaction was never so much thick to be considered an adverse effect.

Reoperation by laparotomy, if required, is easily performed cutting the mesh during wall incision, and resuturing it at the end of operation.

The weight gain of operated patients, in the long run doesn't frustrate the function of the "round mesh". As a matter of fact, the fat storage is observed in the subcutis or into the coelomic cavity, without respiratory failure or postural impairment.

We believe that the "round mesh" operation opens new perspectives of functional surgery in abdominal wall restoration and it will be better emphasized in the world if some Company will take the challenge of supplying the surgeons with dedicated instruments and purposely built mesh

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