Composite ALT flap for structured reconstruction of the abdominal wall: New insights from long-term outcomes in 14 patients

Dear Sir,

Little is known on the long-term performance and functional outcomes in full thickness reconstruction using composite anterolateral thigh (ALT) flaps associated with Vastus Lateralis (VL) and fascia lata (FL) in complex abdominal wall repair (AWR).¹ The role of muscle atrophy and loss of fascia tensile strength over time, potentially influencing abdominal wall stability, still needs to be addressed.

We analyzed long term outcomes of AWR using ALT-VL flaps, focusing on flap properties, flap atrophy over time and the role of a combined mesh.

After selecting all patients who had required AWR using autologous flap reconstruction from May 2003 to June 2017 in our institution, only patients with full thickness defects (including both muscle and fascia) and who benefited of composite anterolateral thigh (ALT+VL) flaps were included. After criteria application we could finally extract from the Department database fourteen patients who benefited from composite ALT-VL reconstructions. Mean age of the 14 patients (8 males, 6 females) was 60 ± 13 years (average $\pm$ SD). ALT flaps were tailored depending on the location and transferred as pedicled or free flaps according to defect position and thigh length/trunk ratio (10 pedicled, 4 free).

Composite ALT flaps allowed the reconstruction of all 3 layers in 3-dimensional abdominal defects: vastus lateralis can mimic the rectus abdomini muscle, with the rectus femoris fascia and fascia lata giving continuity to the abdominal fascia on both sides of the flap (Figure 1).

No statistically significant difference in preoperative defect size (both fascia and skin) was present between the two groups of patients ($p = 0.05$). No significant differences in operative time or flap-related complications (all flaps healed uneventfully) were noticed between pedicled or free flaps. Time to complete healing was 20.1 ± 5.36 days (average $\pm$ SD) for pedicled flap and 17.75 ± 6.95 day (average $\pm$ SD) for free flaps. Average hospitalization time was 23.7 ± 12.27 days (average $\pm$ SD) for pedicled flap and 21.5 ± 3.32 day (average $\pm$ SD) for free flaps. No statistical difference was present between these groups after analysis.

In order to investigate the relation between flap integrity and clinical outcomes in the long term, volumetric imaging analysis was performed using calculation-imaging program tools on both follow-up CT scans and MRI. In order to avoid unnecessary radiation, tight radiological follow-up was only

Figure 1 The composite ALT flap includes fascia lata and the vastus lateralis muscle allowing reinforced support while replacing the missing components of the abdominal wall musculature.

Figure 2 Resorption percentage of flap volume over 12 months comparing flaps with preserved innervation to reinnervated flaps. Values are expressed as average $\pm$ SEM (* $p < 0.05$).

performed in patients who had a defect following tumor extirpation at risk of oncological recurrence (9 out of 14 patients). Flap volumes were performed at 3 months, 6 months and every year post-operatively.

Volumetric measurements and imaging confirmed flap stability over time, assuring coverage, support and avoiding dead space. As expected, free re-innervated flaps showed a significant volume loss when compared to their pedicled innervated counterparts (** 9.67 ± 2.78 in pedicled group vs 22 ± 2 in free transfer group; values expressed as average $\pm$ SD) (Figure 2). In our series resorption did not influence the stability of reconstruction as this seemed to be more influenced by the reconstitution of an effective fascia layer associated with meshes, rather than by muscle bulk. Despite excellent flap outcomes in terms of coverage and re-establishment of anatomical layers, the long-term outcome of these reconstructions showed that even a resistant tissue component like the fascia lata undergoes progressive stretch under continuous intrabdominal pressure. The almost total absence of rectus abdomini muscle to contrast intrabdominal pressure had probably a further role in bulge recurrence.

Three patients out of 14 (2 free and 1 pedicled flaps reconstructions, 21%) presented abdominal bulging at 35 months follow-up. Interestingly, abdominal bulge did not impact significantly on quality of life, with similar clinical scores from abdominal wall functional questionnaires (HerQLes), and only one patient required a secondary mesh placement.

If defect size did not influence the choice of flap (pedicled v/s free), defect location could influence the reconstructive choice as pedicled transposition to the upper abdominal quadrant is limited by the thigh length/trunk ratio.² When defects were multiple, or extending caudo-cranially, free flaps guaranteed better inset possibilities and were preferred.

Despite the severity of the repaired full thickness defects in this series, the recurrence hernia rate compared favorably with the literature (particularly considering the bridging repair).³⁻⁵ Flap atrophy varied between pedicled and free flaps, but did not seem to have significant repercussions on abdominal wall stability, at least from a clinical point of view.

In conclusion, the composite nature of the antero-lateral thigh flap, when harvested with the vastus lateralis muscle and vascularized fascia lata, can mimic abdominal wall structures, allowing an anatomical and functional reconstruction of the abdominal wall, by establishing a continuity between remnant patient fascia layers and vascularized fascial extensions of the flap. The use of mesh should be associated to flap reconstructions to allow for highest possible durability of the results.

Disclosures

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References

1. Khansa I, Janis JE. Modern reconstructive techniques for abdominal wall defects after oncologic resection. *J Surg Oncol* 2015;111:587-98.
2. Vranckx JJ, Stoel AM, Segers K, Nanhekhian L. Dynamic reconstruction of complex abdominal wall defects with the pedicled innervated vastus lateralis and anterolateral thigh PIVA flap. *J Plast Reconstr Aesthet Surg* 2015;68:837-45.
3. Rosen MJ, Krpata DM, Ermlich B, Blatnik JA. A 5-year clinical experience with single-staged repairs of infected and contaminated abdominal wall defects utilizing biologic mesh. *Ann Surg* 2013;257:991-6.
4. Giordano S, Garvey PB, Baumann DP, Liu J, Butler CE. Primary fascial closure with biologic mesh reinforcement results in lesser complication and recurrence rates than bridged biologic mesh repair for abdominal wall reconstruction: a propensity score analysis. *Surgery* 2017;161:499-508.

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5. Sosin M, Nahabedian MY, Bhanot P. The perfect plane: a systematic review of mesh location and outcomes, update 2018. *Plast Reconstr Surg* 2018;142:1075-116S.

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