

The Role of STSG and Delayed Midline Approximation In Abdominal Wall Reconstruction

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Background: Acquired abdominal wall defects can result from previous surgery, trauma, infection and tumor resection. Complex abdominal wall defects challenge both general and plastic reconstructive surgeons. Skin grafting of abdominal viscera was originally described by Horton in 1953, demonstrated in dogs that STSG placed on the parietal peritoneum of abdominal viscera and buried in the peritoneal cavity would take well and survive. In 1994, Baker and Millard Jr reported serial cases of abdominal midline wound dehiscence which was treated with two stage abdominal wall reconstruction.

Methods: Data was taken from medical and surgical records of patients consulted to the plastic surgery division with and acquired abdominal defect. We are reporting, Male, 42 yo, previous history of Perforated appendicitis with general peritonitis. We performed 2 stage reconstruction of abdominal wall for this patient.

Results: Treatment for an abdominal defect is selected on the basis of several factors, including the medical status of the patient, wound bed preparedness, depth, size and location of the defect. The goals of abdominal reconstruction are restoration of function and integrity of the musculo-fascial abdominal wall, prevention of visceral eventeration and provision of dynamic muscle support.

Summary: Skin grafting and delayed midline approximation are one of the reconstructive option available and deserve to be considered in the high risk, septic patient without compromising the patient final reconstructive result

Keywords: abdominal wall reconstruction, STSG, midline approximation

Latar Belakang: Defek dinding abdomen sekunder dapat diakibatkan oleh riwayat operasi sebelumnya, trauma, infeksi, dan reseksi tumor. Defek dinding abdomen yang kompleks ini merupakan tantangan berat bagi spesialis bedah umum dan bedah plastik yang menanganinya. Tindakan tandur kulit pada visera abdomen pertama kali dilakukan oleh Horton tahun 1953 dan berhasil dengan baik. Pada tahun 1994, Baker dan Millard Jr melaporkan beberapa kasus dengan luka abdomen yang dehisensi ditangani dengan rekonstruksi dua tahap.

Metodologi : Data diambil dari rekam medis dan dokumentasi saat pembedahan pada pasien dengan defek dinding abdomen yang dikonsulkan ke divisi bedah plastik dan rekonstruksi RSCM. Didapatkan kasus laki-laki 42 tahun dengan riwayat appendicitis perforasi. Kami melakukan rekonstruksi dua tahap pada pasien tersebut.

Hasil: Tatalaksana defek dinding abdomen dipilih berdasarkan beberapa faktor, kondisi medis pasien secara umum, bed luka, kedalaman, ukuran dan lokasi defek. Tujuan rekonstruksi dinding abdomen adalah pengembalian fungsi dan integritas otot dan fascia dinding abdomen, pencegahan eventerasio, dan menjaga kekuatan otot abdomen.

Kesimpulan: Tandur kulit dan aproksimasi kulit yang ditunda adalah salah satu pilihan terapi dan dipertimbangkan terutama pada pasien dengan resiko tinggi dan sepsis dengan tetap mempertahankan kualitas hasil akhir rekonstruksi.

Kata Kunci: abdominal wall reconstruction, STSG, midline approximation

Acquired abdominal wall defects can be caused by a history of previous surgery, trauma, infection, and tumor resection¹⁻⁹. Complex abdominal wall defects challenge both general and plastic

reconstructive surgeons. An understanding of the surgical anatomy of the abdominal wall is crucial when planning reconstruction.

The abdominal wall is composed of multiple overlapping fascial and muscular layers that allow for regional advancement with

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complete continuity. Laterally, the muscle groups overlap one another in contrasting orientation, thus provide a great deal of dynamic support. The fascia of the internal oblique, external oblique, and transversus abdominis converges to form the anterolateral abdominal wall.

The blood supply to the anterior abdominal wall is provided by a deep and a superficial vascular system^{10,11}. The skin, muscle, and subcutaneous tissues are supplied by direct cutaneous vessels from the superficial circumflex iliac and superficial inferior epigastric arteries. Musculocutaneous branches from the deep inferior epigastric and superior epigastric arteries also provide blood supply to the anterior abdomen. The blood supply of the lateral abdomen is provided by intercostal, subcostal, and lumbar arteries¹². Interruption of these vessels can increase the chances of midline skin necrosis, wound infection, and dehiscence. The motoric and sensoric innervation to the anterior abdominal wall is provided by the intercostal, subcostal, iliohypogastric, and ilioinguinal nerves that course circumferentially from posterior to anterior. As much of the innervation as possible should be maintained to the external oblique, internal oblique, transversus abdominis, and rectus muscles to preserve dynamic support to the abdominal wall^{12,13}.

Treatment for an abdominal defect is selected on the basis of several factors, including the medical status of the patient, wound bed preparedness, depth, size and location of the defect. The utilization of different techniques is emphasized in treating this defect such as skin grafts, skin flaps, muscular or musculocutaneous flaps and tissue expanders^{14,15}.

The goals of abdominal reconstruction are restoration of function and integrity of the musculofascial abdominal wall, prevention of visceral eventration and provision of dynamic muscle support^{2,13}.

Skin grafting of abdominal viscera was originally described by Horton in 1953, demonstrated in dogs that STSG placed on the parietal peritoneum of abdominal viscera and buried in the peritoneal cavity would take well and survive. Clinical application of this idea in the treatment of intraabdominal sepsis was described by Millard et al by placing STSG directly

on the exposed viscera protruding through the abdominal wall defect in 1969 and 1977¹⁶⁻¹⁸.

We are reporting a case of the abdominal wall defect, with history of perforated appendicitis and sub hepatic abscess with the high risk and septic patient. We performed two stage reconstruction for this patient, using STSG for the first stage of reconstruction and delayed midline approximation in the next 6 months.

We would like to encourage that skin grafting and delayed midline approximation are a reconstructive option and deserve to be considered in the high risk, septic patient without compromising the patient's final reconstructive result.

PATIENTS AND METHOD

Male, 42 yo, with a history of perforated appendicitis with general peritonitis 6 months prior. In the emergency operating theatre the patient underwent laparotomy appendectomy. On day 8th during hospitalization in the ward, the midline incision was dehiscence. This wound dehiscence was treated by the digestive division for over 30 days. This patient was then consulted to our plastic and reconstructive surgery division. The general status of the patient was not in good level with sign of sepsis.

We performed two stage reconstruction on this patient. The 1st stage was skin grafting and 2nd stage was delayed midline approximation. The wound bed was well prepared before skin grafting. The defect was skin grafted under local anesthesia with EMLA. We made a tie over to fixate the STSG. (Figure 1 and 2)

We performed the second stage reconstruction 6 months after previous surgery. This delayed midline approximation procedure was performed under general anesthesia. We excised the skin graft so we could see the viscera. Then we performed intradermal sutured with prolene 3.0 cutting. For skin sutured we performed continuous suture with prolene 4.0 cutting. (Figure 3)

After surgery, ventilator function is monitored. Returning abdominal viscera into peritoneal cavity may impact diaphragmatic excursion early on until the abdominal tissue have adjusted to the old intra peritoneal volume.



Figure 1. Left picture : Granulation tissue on the midline. Center picture : STSG and tie over under local anesthesia. Right picture : Day 14th post STSG, the graft is take 100%



Figure 2. We encouraged the patient to do some diet program to lose his body weight in order to gain 3 more proportional dimension of abdominal wall. We also suggested the patient to wear an abdominal corset to prevent herniation of viscera.



Figure 3. Intraoperative pictures of second stage surgery. Left picture : viscera were exposed after skin graft excision. Right picture:midline approximation (after layer by layer suture)

Post operative treatment patient was treated in the ward for 3 days to monitor the skin suture then patient treated as an out patient. We still suggested the patient to wear the abdominal corset until the scar matured. We also suggested the patient to continue his diet program. The patient was then followed up until 2 months post operative as we can see in figure 4.

DISCUSSION

Surgeons who operate within the abdomen occasionally encounter an abdominal wall defect that cannot be closed primarily. Some series have reported a 10 percent incidence of ventral herniation requiring repair after initial abdominal surgery. Incisional hernia is a common complication of abdominal surgery,



Figure 4. Post operative Follow up (2 months after surgery)

occurring in up to 11 percent of patients. In patients who develop postoperative wound infections, the rate of incisional herniation increases to 23 percent^{3,19}.

Midline laparotomies are the most frequent sites of incisional herniation²⁰⁻²². The cause of many of these midline hernias is lateral migration of the midline structures. When the linea alba is separated, the lateral abdominal wall fascia and muscle no longer have their insertion²³⁻²⁶. With poor re-approximation and healing of the linea alba, the hernia develops. The continued myofascial contraction, laterally, and intraabdominal pressure maintain and enhance the defect. The rectus sheaths are also translated laterally and become fibrotic into position. With this wound breakdown, the dynamic and evenly distributed abdominal wall forces are now unopposed and are translated maximally on the weakened midline because of lateral pull. It is believed that excessive tension and subsequent ischemia at the midline cause poor healing and then herniation. This tension is because of lateral muscular forces. To prevent this tension, it would be optimal to negate tension at the site of coaptation²⁷.

The philosophy and approach to these defects has changed over the years. There have been technical, biomedical, and surgical technique advancements. Material advancements have included the creation of permanent (i.e., polypropylene and polytetrafluoroethylene) and absorbable (i.e., polyglycolic acid) meshes, which have been used to replace autogenous defects and recreate abdominal wall continuity²⁸⁻³³. However, these materials lack the dynamic stability offered by innervated, autogenous tissue and have the continued risk

of infection, extrusion, fistulization, and recurrent herniation³⁴⁻⁴⁰. Technique advancements have offered the use of local and distant flaps to assist in wound closure⁴¹⁻⁴⁶. These flaps are limited by lack of viable donor sites, loss of dynamic muscular support caused by denervation, and donor-site morbidity. Plastic surgeons are usually consulted in this type of cases after the initial or repeated closure attempts have failed. It has been the goal of plastic surgeons to close these defects using autogenous methods, if possible.

The use of autologous tissue provides a definitive surgical treatment of infected abdominal wall hernias has become more common place. Skin grafting of abdominal viscera was originally described by Horton in 1953, demonstrated in dogs that STSG placed on the parietal peritoneum of abdominal viscera and buried in the peritoneal cavity would take well and survive. Clinical application of this idea in the treatment of intra abdominal sepsis was described by Millard et al by placing STSG directly on the exposed viscera protruding through the abdominal wall defect in 1969 and 1977¹⁶⁻¹⁸.

In this case, Male, 42 yo, history of Perforated appendicitis with general peritonitis 6 months ago. In emergency operating theatre was performed laparotomy appendixectomy. On day 8th during hospitalization in the ward, the midline incision was dehiscence. This wound dehiscence was treated by the digestive division for over 30 days. This patient was then consulted to Our Plastic and Reconstructive division. The general status of the patient was not in good level with sign of sepsis. We performed 2 stage reconstruction of abdominal wall for

this patient regarding his general condition and the failure of defect closure from previous surgery resulting in ventral herniation.

Clearly, one should consider all options such as primary closure, synthetic mesh, locoregional flap and distant flap. Primary closure with risk of excessive tension, synthetic mesh with risk of infection, wound sepsis, fistulization and extrusion. Flap, here to be considered are possible flap ischemia, donor site morbidity and added time of surgery.

In the dehiscence and contaminated phase, skin grafting of the viscera closes the wound and restore homeostasis. When the condition of the patient is recover then midline approximation performed. This technique provide viable reconstructive alternative with a final result similar to the original laparotomy closure had dehiscence never occurred.

SUMMARY

Skin grafting and delayed midline approximation are a reconstructive option and deserve to be considered in the high risk, septic patient without compromising the patient final reconstructive result.

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