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Case Report

Hemicorporectomy; Describing a Single-Stage Surgical Technique: A Case Report

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Abstract

Background: Hemicorporectomy is a life-saving operation to maintain the survival of patients with severe and irreversible pelvis and lower extremities injuries. In the typical procedure, removing lower extremities and pelvic viscera in the two stages might result in hemodynamic instability, intraoperative and postoperative morbidities, and more deficient patients' survival. In this study, we aim to describe our experience with a new technique for one-stage hemicorporectomy, which minimizes surgical time and intraoperative bleeding.
Case Report: A 77-year-old male patient with lower limb gangrene after previous vascular surgery for an abdominal aortic aneurysm in an unstable situation underwent hemicorporectomy in one step.
Conclusion: We believe that achieving a one-step procedure, especially in non-malignant cases or in the absence of severe trauma lesions, may be a viable option in emergency surgery cases or hemodynamic instability. However, there is still a need to modify the single-stage surgical technique in later experiments.

Keywords: Aorta; Aortic Aneurysm; Gangrene; Surgical Procedures; Operative Procedures

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Background

Translumbar amputation, halfectomy, or hemicorporectomy is a life-saving operation to maintain the survival of patients with severe and irreversible pelvis and lower extremities injuries. This procedure was initially proposed by Kredel in 1950 for patients with severe injuries due to advanced metastatic cancers (1). Although the ultimate goal of such a procedure was to prevent patient death, the initial procedures did not essentially lead to patient survival (2).

Various reasons can be explained for the failure of this surgery in the initial experiments. The most important was the lack of optimization of surgical technique and the complications during and after the operation. These include severe hypotension, superficial wound dehiscence, osteomyelitis, massive bleeding, recurrent urinary tract infection (UTI), pyelonephritis, and severe sepsis (3, 4). By making gradual modifications in the surgical technique, it is possible to prevent postoperative complications and ultimately improve the long-term consequences of surgery. Herein, we aimed to describe our experience on a new plan for hemicorporectomy leading to decrease of surgical time and intraoperative bleeding.

Case Report

A 77-year-old man was admitted to the emergency department of Sina Hospital, Tehran, Iran, with the chief complaint of flank pain after getting the coronavirus disease 2019 (COVID-19). In initial investigations, suspicion of abdominal aortic aneurism was raised due to visible and palpable aortic pulse, and after ultrasound investigation, the diagnosis was defined.

The patient was admitted to the vascular surgery ward for further action. However, the day after hospitalization, patient was transferred to the operating room due to the aortic aneurysm rupture in an emergent condition. The patient underwent vascular surgery, and a few days after surgery, he was discharged from the hospital. The patient entered the emergency department about five weeks after surgery with the complaint of bluish lower limbs. He noted that his legs progressively turned blue and then black a week after the vascular surgery. His vital signs were stable in his physical examination, but what attracted attention was his ecchymotic lower limb with multiple malodorous ulcers on his lower limbs and back (Figure 1).

Figure 1. Ecchymotic lower limb with multiple malodorous ulcers on patient's lower limbs and back

His past medical history was ischemic heart disease (IHD) and a history of coronary artery bypass graft surgery (CABG), hypertension (HTN), prostate cancer, a history of surgery, right side nephrectomy, and vascular surgery for

femoral artery 15 years ago. In his past drug history, he mentioned losartan and aspirin usage.

After initial investigations in vascular surgery service and deliberation with orthopedic service due to shreds of evidence of vascular involvement at a higher level than common iliac artery and increased risk of gluteal flap necrosis for hemipelvectomy to obtain a suitable flap, amputation flap was determined above the pelvis and at the lumbar level.

After getting high mortality consent from the patient and his family and preparation actions, the patient was transferred to the operating room.

In the surgical technique, the right lateral decubitus position was planned for easier access to the abdominal aorta near the fourth and fifth lumbar vertebrae. The fasciocutaneous flaps were designed based on the extent of necrosis and the boundaries of healthy tissue and skin. The rectus sheet was cut transversely after incising the skin above the pubic symphysis. The space between the peritoneum and the posterior rectus sheet was then determined. Through the same entrance and maintaining the propagation, the muscles of the anterior, lateral, and posterior walls of the abdomen and trunk were cut posteriorly. First, the internal oblique, external oblique, and transversus abdominis muscles were cut above the inguinal ligament. The insertion of abdominal muscles was removed from the iliac crest. Posterior to the sacrospinalis, quadratus lumborum, and multifidus muscles were cut transversely along the L4 and stripped away from the vertebrae. Thus, the release of the muscles in the left half from the anterior to the posterior was completed.

The L4-L5 disc then appeared in the retroperitoneal space. The thrombosed aortic artery was cut and doubly ligated, anterior to this space. Then, to manage probable hypotension, the inferior vena cava was cut with the coordination of the anesthesia service. Then the L4-L5 discectomy was performed anteriorly. The intraspinal and dura spaces were accessed after resectioning the pedicle and the lamina. Then a spine osteotomy was completed on the remaining area. The patient was then repositioned to the supine position. In the same manner, the release of the muscles in the right half was completed from the anterior to the posterior. At this point, the 360-degree release was completed while maintaining the peritoneum. After peripheral release, the peritoneum was opened by the general surgery service. A semi-proximal colostomy was implanted in the left hypochondriac skin space in the intraperitoneal space. According to the history of the left nephrectomy, the right ureter was identified, and the right ureterostomy was implanted in the right hypochondriac skin space. After separating the remaining peritoneum, the separation of the two halves of the body was completed (Figure 2).

Figure 2. Separation of the two halves of the body

For closing the stump, the abdominal viscera were covered with residual peritoneum (Figure 3).

Figure 3. Closing the stump, the abdominal viscera were covered with residual peritoneum

Finally, the fasciocutaneous flaps were approximated to close the stump (Figure 4).

Figure 4. Fasciocutaneous flaps were approximated to close the stump

An injection of norepinephrine was started for him during surgery, and he received five units of packed red blood cells. After surgery, the patient was transferred to the intensive care unit (ICU) and intubated due to the unstable situation.

About 48 hours after surgery and ICU hospitalization, the patient suffered cardiac and respiratory arrest and unfortunately expired. Results of the patient's vital signs and lab data at the beginning of hospitalization and before and after surgery are listed in table 1.

Discussion

Translumbar amputation or hemicorporectomy is a radical surgery dissecting the body at the waist zone, usually at the fourth and fifth lumbar level (5). In the previously explained procedure, lower extremities and pelvic viscera are removed in two stages, with colostomy and ileal conduit created in the first stage. Then the final hemicorporectomy is considered in the second stage (6).

Table 1. Patient's examination and lab data (beginning of hospitalization, day before, day after, and second day after surgery)

Day	GCS	Intubation status	Vital sign				Lab data					ABG		
			BP	RR	PR	Temperature	Hb (g/dl)	WBC (µl)	PLT (µl)	Cr (mg/dl)	PH	HCO3 (mmol/l)	PCO2 (mmhg)	BE (mmol/l)
Beginning of hospitalization	15/15	No	101/69	18	60	37	8.6	5050	250000	1.13	7.43	23.1	34.9	-0.9
Day before surgery	15/15	No	121/80	19	82	36	9.7	11600	223000	NA	7.48	39.6	52.5	14.2
Day after surgery	-	Yes	90/70 (with norepinephrine)	16	80	36.5	11.9	9700	73000	0.60	7.23	30.6	73.7	1.4
Second day after surgery	-	Yes	100/60 (with norepinephrine)	16	90	37	9.7	12800	89000	0.86	7.51	26.5	40.6	7.9

GCS: Glasgow Coma Scale; BP: Blood pressure; RR: Respiratory rate; PR: Pulse rate; Hb: Hemoglobin; WBC: White blood cell; PLT: Platelet; Cr: Creatinine; ABG: Arterial blood gas; PH: Potential of hydrogen; HCO3: Bicarbonate; PCO2: Partial pressure of carbon dioxide; BE: Base excess; NA: Not available

Various indications have been described for hemicorporectomy, including extensive malignancies involving the pelvis, which are resistant to chemoradiotherapy or conventional operations, terminal pelvic osteomyelitis, pelvic chondrosarcoma, severe vascular malformations, acute aortic occlusion leading to gangrene, and a severe trauma of the pelvis (4). The literature shows that of all cases described for hemicorporectomy, about two-thirds have been related to malignancies, 30% for terminal pelvic osteomyelitis, and others for trauma or benign conditions (1, 7).

The surgical outcome has been more favorable in nonmalignant patients with a survival rate of 2.9 years compared to other indications with 11 years survival rate (8). The main factors affecting patients' survival include wound dehiscence, volume overload, delayed healing, decreased body mass, hemodynamic imbalance, and sepsis (9, 10).

Earlier, the leading cause of patients' death was pulmonary HTN (11). Another point about postoperative morbidity is the factors related to the procedure technique, especially its two-stage procedures. Performing surgery in two stages may be accompanied by significant intraoperative blood loss and a greater risk of hemodynamic instability within and after the procedures (12). Therefore, reducing two-step to one-step operation can have potential benefits despite the difficulty of the procedure.

As achieved in our recent experience, only five units of blood were needed during surgery, which was much less than previously reported. Additionally, the duration of the operation was 4 hours, which was much shorter than the reported cases, which significantly reduced the incidence of intraoperative hemodynamic instability and postoperative complications (13-16). It also seems that considering the emergency and unstable conditions of the patient, the decision to perform surgery in one step is a much more logical and rational decision. Unfortunately, our patient expired 48 hours after the operation without being extubated. We guess that, on the one hand, old age, unstable conditions, and severe cachexia before the surgery; and on the other hand, stressful surgical conditions were significant causes of premature death in our patient. However, we decided to perform this procedure due to extensive tissue necrosis, generalized gangrene, and the implantation of larvae and insects inside necrotic tissues.

Conclusion

We believe that achieving a one-step procedure, especially in non-malignant cases or in the absence of severe trauma lesions, may be a viable option in emergency surgery cases or hemodynamic instability. However, there is still a need to modify the single-stage surgical technique in later experiments.

Conflict of Interest

The authors declare no conflict of interest in this study.

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Written informed consent was obtained from the patient's children for this case report and any accompanying images.

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