

## Anatomical Difficulties of Hemipelvectomy and Sacrectomy from the View of Vascular Complex

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### Mini Review

Hemipelvectomy and Sacrectomy are infrequently performed and associated with a high rate of postoperative mortality and morbidity [1-5]. The difficulty of these procedures are contributed by a lot of factors including the anatomical complexity, the proximity of important organs and structures including major nerves, viscera, and major vessels, consistency of huge tumor, necessity of intraoperative postural change, pelvic ring reconstruction and high rate of postoperative complications [2,5-7]. The important large arteries in the pelvic cavity consist of the common iliac artery and its downstream arteries. The important downstream branches of those arteries are the superior and inferior gluteal arteries and obturator arteries. The following structures in pelvic cavity should be treated carefully; femoral nerve, sciatic nerve, nerve roots from lumbar vertebrae and sacrum and ureters. They are sometimes hidden by tumor and are easily damaged with surgical procedures. The greater sciatic notch is one of the most careful points during pelvic tumor resection because of anatomical importance and limited visibility.

The greater sciatic notch is one of the pivotal points of hemipelvectomy. The important bridging vessels, inferior and superior gluteal arteries (SGA), crosses right under the sciatic notch. Severe hemorrhage is caused by damaging these vessels [8]. The blood flow of the gluteus maximus muscle is maintained by inferior gluteal artery (IGA). Thus, preserving healthy inferior gluteal artery is a key of reducing postoperative complications including flap necrosis and deep infection. Less visibility around greater sciatic notch easily causes careless injury of SGA and IGA, which induce subsequent hemorrhage or flap necrosis [8]. Ligation of the internal iliac artery is recommended for prevention of severe hemorrhage by inadvertent injury of SGA and IGA [9]. But in this case, the possibility of increasing rate of severe postoperative complications including sepsis and deep infection following flap necrosis is not considered.

The high rate of postoperative complication rates following hemipelvectomy and sacrectomy is devastating problem [4,6,10]. Wound complications are particularly common [3,4,11]. The flap necrosis rates are reported up to 38% [3,4,12]. The wound infection rates are up to 79% [3,4,12,13]. Several papers stated the importance of preserving the blood flow of the gluteus maximus to avoid the postoperative flap necrosis [3,14]. More proximal ligation level of iliac artery is highly associated with the higher rate of postoperative flap necrosis [3]. The common iliac artery ligation has more adverse influence on flap integrity compared to external iliac artery ligation. A

postoperative flap necrosis rate of 60% was observed in cases of fasciocutaneous hemipelvectomy flap detachment from the gluteal muscles [14]. Thus, preserving the flap integrity of the gluteus maximus muscle with the fasciocutaneous part is a key to avoid postoperative flap necrosis [14]. Postoperative flap necrosis is one of the primary risk factors causing deep infection and subsequent sepsis, which is one of the most common causes of in-hospital death following hemipelvectomy and sacrectomy. The perioperative mortality rates reached up to 8% [3,4,12]. Thus, preserving flap perfusion is a key to reduce postoperative morbidities and mortality.

Computer navigation-assisted surgery for hemipelvectomy and sacrectomy has recently shown more accurate resection, reconstruction, and implant positioning compared to conventional procedures [2]. It enables intraoperative precise detection of IGA at the greater sciatic notch while avoiding injury as well [15]. The obturator artery and sacral nerve roots surrounded by tumor were detected as well. Preserving the IGA and prevention of postoperative deep infection was achieved in all cases [15].

Prevention of inadvertent injury of IGA or SGA did not decrease the incidence of intraoperative bleeding [15], because the greater sciatic notch was not only intraoperative bleeding area. Obturator artery, the Santorini venous plexuses, and surface of osteotomy are intraoperative bleeding areas as well.

In conclusion, preserving the blood flow of the gluteus maximus is one of the most important points to prevent postoperative flap necrosis and subsequent hazardous infection. Thus, we have to avoid unconsidered ligation of internal iliac artery and its downstream vessels and inadvertent injury of those vessels. However, it is sometimes difficult to detect the IGA at the greater sciatic notch. The computer-assisted navigation system can support intraoperative detection of IGA. It can reduce postoperative complications following hemipelvectomy and sacrectomy.

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