Robotic-Assisted Surgery: Low-Cost Options

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6.1 Introduction

Open surgery is based on the access to the treated organ via one large 5- to 30-cm incision dividing the skin and abdominal muscles or fascias. This large skin incision provides the surgeon and assistant(s) with a direct view of the anatomy, enabling the introduction of their hands and instruments. They can look down at their work with their heads and necks in a neutral position, using both hands, with natural hand-eye coordination (Fig. 6.1a). For delicate surgical actions, it is even possible to support the wrists by leaning on the patient’s body or on a specially developed armrest [7, 21, 33]. However, there are also some drawbacks, particularly in case of pelvic surgery:

- The light conditions might be suboptimal.
- The distance to the tissue/organ is relatively long (i.e., urethra).
- The view to the object might be hindered by bone (suprapubic spine).
- The view for the assistant might be suboptimal due to the narrow anatomical conditions.
- The position of the surgeon is ergonomically suboptimal (i.e., torsion of the body).

Therefore, in open surgery, surgeons started to work with headlights and magnifying loops (Fig. 6.2) or used digital systems for high definition (HDTV, Olympus-IBE, Hamburg, Germany). Recently, an external magnifying camera system has been introduced [44].

Endoscopic surgery represents an operating technique based on the access to the tissue via several small skin incisions, ranging from 3 to 15 mm. One incision is used for insertion into an endoscope. The surgeon and assistant(s) look at a monitor on which the endoscopic images are displayed (Fig. 6.1b). To create a sufficient working space inside the patient, the cavity (peritoneum and retroperitoneum) is insufflated with carbon dioxide. To prevent leakage of the gas and to protect the tissue near the incision, the instruments are inserted