

Pediatric surgery and pediatric surgical oncology

Jin-Zhe Zhang

Beijing, China

Despite major advances in pediatric surgery, skills at the operating table should not be neglected. Surgical technique requirements differ in children of different ages, and many techniques are special in pediatric surgery. The following is a brief account of my experience showing the peculiarities of surgery in children (more illustrative in newborns) and suggestions for up-grading pediatric surgical techniques.

Peculiarities in pediatric surgery

The abdominal cavity of a baby is relatively small, while the tumor is much bigger. A large enough transverse incision should be made and then all intestines are placed out of the abdomen, making the abdominal cavity nearly empty to expose the tumor fully as much as possible.

In severely distended intestine of a newborn (The intestinal wall looks like a transparent plastic film), its seromuscular coat may burst into bivalves suddenly following even a negligible injury, leaving an isolated bare mucosal tube bulged out from the broken intestine coat, which will naturally lose its viability (Fig. 1). In order to avoid peritoneal contamination due to puncture leakage, a fine needle connected to a suction can be used. Complete decompression should be achieved until the intestinal wall recovers its normal thickness and color. Sometimes, a little bit antibiotics may be injected before pulling the needle, and additional fine suture is rarely necessary.

At the critical moment when a rapid closure of the abdomen requires for resuscitation, the wound should be closed in a few minutes. Commonly, the patient's

condition is very poor and anesthesia is inadequate. It is wise to leave all the intestines outside the abdomen undisturbed. Running suture from one end of the wound is used to close most parts of abdominal wound until a small opening (about 2-3 stitches untied) is left behind. Then the outside intestine is sent in its natural sequence into the deep part of the abdominal cavity, and finally the rest stitches are tied (Fig. 2).

The largest chest wound is in the 6th intercostal space (ICS, cut-in directly without rib resection) of neonates for tumors of all locations in the thoracic cavity (Fig. 3A).

Subcutaneous binding of the upper and lower marginal ribs of the wound by 4 heavy stitches to close the wound tightly air-proved (Fig. 3B). No drainage is preferred because the chest wall is too thin to keep the drainage air tightly. If necessary, daily aspiration may be required.

A small catheter in the small urethra may serve as a plug causing obstruction. Suprapubic cystostomy is preferred when necessary, particularly in the urethra surgery.

"S" curved incision is preferred for laminectomy in small kids in order to prevent the direct exposure of the cord in case of wound disruption. The accurate number of the vertebra is difficult to obtain by palpation on the back of a small kid. A pre-placed nail on the spinal process nearby the selected vertebra (location of tumor) in a plain film may help to count the number of vertebrae accurately with the retention nail as a landmark during operation (Fig. 3C).

Special attention to tumor-removal

Do not touch the tumor before knowing the followings: tendency of bleeding? distention to surrounding vessels? active oozing? capsule broken or high tension? definite anatomical location and organs? any organ or big vessels adhered? If necessary and possible, pre-placed temporary tourniquets on feeding vessels are preferred (Fig. 3D).

A perfect plan should be made so that the procedure can be stopped at any step, and the abdomen may be closed in a few minutes. Sharp dissection under direct vision should be the principal technique for mobilizing a

Author Affiliations: Department of Pediatric Surgery, Beijing Children's Hospital, Capital Medical University, Beijing 100045, China (Zhang JZ)

Corresponding Author: Jin-Zhe Zhang, MD, Honorary Fellow of the Royal College of Surgeons (HonFRCS), Member of Chinese Academy of Engineering (MCAE), Professor and Senior Consultant of Pediatric Surgery, Beijing Children's Hospital, Beijing 100045, China (Email: jinzhezhang@sina.com)

doi:10.1007/s12519-009-0045-y

©2009, World J Pediatr. All rights reserved.

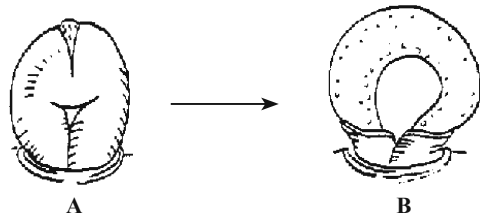


Fig. 1. An isolated bare mucosal tube bulged out from the broken intestine coat, which will naturally lose its viability (A: breakage; B: mucosa tube bulging out).

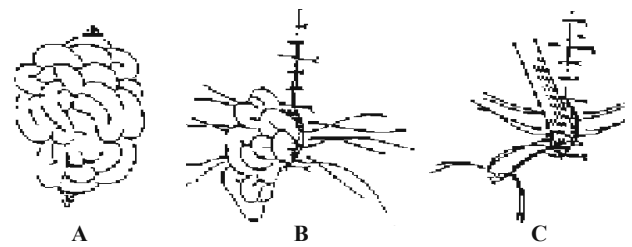


Fig. 2. Emergency closure of the abdomen (A: leaving intestines out; B: subtotal closure of wound; C: return of the intestine, and closure).

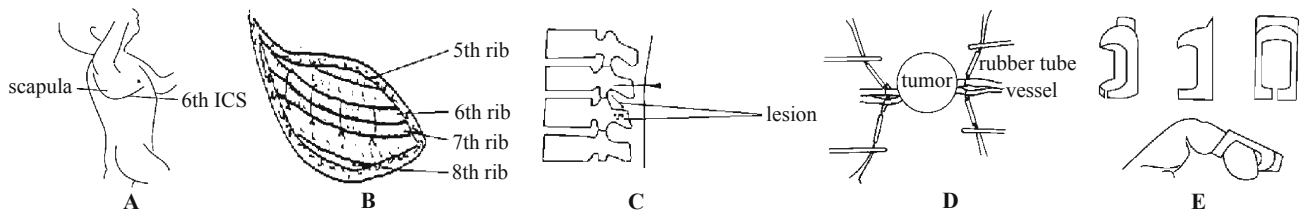


Fig. 3. A: The 6th intercostal space (ICS) incision under the scapula; B: Closure of the chest wound by binding ribs; C: Vertebra nailing on plain film; D: Temporary tourniquets; E: Metal finger-tip showing palpation (from Zhang JZ. Metal finger-tip periostotome. *Chin J Pediatr Surg* 1985;6:182).

tumor.

Sharp scalpel gently cuts in the surface of the vessel or nerve along its long axis. The outer fibrous layer lays open and the organs are exposed totally free.

In soft adhesion, tumor is movable. In order to protect the tumor from squeezing or injury, sharp dissection under direct vision and/or finger break is advised. Special attention should be paid to any vessel or nerve being caught in the adhesion.

In hard adhesion, tumor is not movable. Sharp dissection under vision is the only choice. Although there is rarely big vessel or nerve being caught, some neighboring organs might be caught or stretched.

In bony adhesion, tumor is usually fixed to the bony structure, e.g., the vertebra or pelvis, and hard to raise. A periosteal elevator should be held steadily and closely against the bony surface. The instrument should be pushed slowly and the distance of every advancement should be controlled as short as possible. Any injury to surrounding structures and cutting into the bony tissue should be avoided. A metal finger-tip periostotome designed in 1980 may serve as a reference (Fig. 3E), which is like the thimble for sewing needle and worn outside the glove on the fore-finger with a window on the palm side allowing free palpation and a metal finger-nail on the back serving as the periosteal elevator.

In case of a huge tumor such as Wilms' tumor, the under surface may be adherent to big vessels

underneath. Forceful lift may cause tearing of tissues and hemorrhage. In order to put it under direct vision, a combined thoraco-abdominal incision may be advisable. If available, a malleable laryngoscope and a mini-ultrasonic probe may be inserted into the narrow space of the undersurface of a huge tumor to make the dissection under vision. If the tumor accidentally breaks during or before operation, all the dislodged tissues and the residual tumor should be cleansed as possible. After a thorough lavage, some proper chemotherapeutic drugs and metal markers or Titanium clips might be placed in the tumor bed for continuous treatment and as landmarks for later radiation therapy respectively.

In summary, a qualified pediatric surgeon has to be familiar with the surgical principles required for the peculiarities of the baby and the tumor. For the time being, the up-grading of tumor surgery depends on the further exploration and the improvement of laparoscopic skills, which will be the leading point of the evolution in all respects.

Funding: None.

Ethical approval: Not needed.

Competing interest: None declared.

Contributors: Zhang JZ is the single author of the paper.

Received June 5, 2008

Accepted after revision October 7, 2008