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USE OF MODIFIED MAKUUCHI INCISION FOR SURGICAL TREATMENT OF ABDOMINAL TUMOR IN CHILDREN

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Abstract:.- OBJECTİVE: Classical transverse, vertical abdominal or thoracoabdominal incisions in pediatric patients are frequently used to remove large abdominal tumors such as hepatoblastoma and neuroblastoma. We present our initial experiences on our patients who was operated by modified Makuuchi incision.

MATERİALS AND METHODS: We used this incision in 6 cases with large abdominal tumors (1 hepatoblastoma and 5 neuroblastoma and/or ganglioneuroma) between January 2019 and August 2020.

RESULTS: These patients had previously received chemotherapy according to appropiate protocol. The exposure of surgical field was perfect with this incision and dissection of the tumors was easily performed. Complete removal of large abdominal tumors was successfully achieved in the patients although the masses have close proximity and adhesions with important structures and organs. There was serous collection in 2 patients and it resolved spontaneously. No wound infection, hernia or wound dehiscence was observed during a mean follow-up of 9.6 months (ranged from 3 to18 months).

CONCLUSİON: According to our preliminary experiences, the Modified Makuuchi incision provides a nice exposure for removal of large abdominal tumors to the surgeons and is well tolerated by children.

Keywords: *Modified Makuuchi incision. Hepatoblastoma. Neuroblastoma. Surgery.*

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Resumen:.- OBJETIVO: Las incisiones clásicas transversa, abdominal vertical o toracoabdominal en pacientes pediátricos son utilizadas frecuentemente en la escisión de tumores abdominales de gran tamaño como el hepatoblastoma y el neuroblastoma. Presentamos nuestra experiencia inicial en pacientes operados usando la incision de Makuuchi modificada.

MATERIALES Y MÉTODOS: Usamos esta incision en 6 casos con tumores abdominales de gran tamaño (1 hepatoblastoma y 5 neuroblastomas y/o ganglioneuroma) entre Enero 2019 y Agosto 2020.

RESULTADOS: Los pacientes recibieron quimioterapia neoadyuvante según protocolo. La exposición del campo quirúrgico, así como la disección del tumor, fue perfecta con esta incisión. Se logró remover la totalidad de los tumores con éxito a pesar de su proximidad y adherencias a órganos vecinos. Dos pacientes presentaron colecciónes serosas que se resolvieron espontáneamente. No se observaron infecciones de

herida, hernias o dehiscencia de heridas durante el período de seguimiento con una media de 9.6 meses (rango de 3-18 meses).

CONCLUSIONES: Según nuestra experiencia preliminar, la incisión de Makuuchi modificada ofrece al cirujano una buena exposición del campo quirúrgico para la extirpación de tumores abdominales de gran tamaño, además de ser bien tolerada por los niños.

Palabras clave: *Incisión de Makuuchi modificada. Hepatoblastoma. Neuroblastoma. Cirugía.*

INTRODUCTION

Although laparoscopic or robotic surgeries in the surgical treatment of abdominal masses in recent years are widely used, some of the surgeons still prefer open surgical approaches. Additionally, open surgical approachs are an obligation in some cases with previous abdominal surgery or a large abdominal mass. Incision is very important for the safe and successful surgery. Classical transverse, vertical abdominal or thoracoabdominal incisions in pediatric patients are frequently used to remove large abdominal tumors such as hepatoblastoma and neuroblastoma. There is no superiority among the incisions. The size of the tumor, location of tumor and surgeon's experience are the selection criteria for the incision. In an open surgery, incision should provide a nice exposure during the surgery. Well-exposure of surgical area provides less blood loss, easy access to surgical field, comfort of the dissection and short operation time. Additionally, it should contribute to less postoperative pain and surgical complications. In this paper, we introduce the modified Makuuchi incision in pediatric patients. This incision in adult patients have been using for surgical treatment of liver tumors by general surgeons and for renal tumors by urologists(1-4). Masatoshi Makuuchi first described the J incision for hepatic surgery in 1993(5). This incision briefly consists of a midline incision from the xiphoid 5 cm above the umbilicus and a second incision extending into the 9th intercostal area with a J-shaped curve. This incision was later modified by Chang(2). Some authors have used this incision for major abdominal surgeries (1,3). Lastly, this incision has ben used to remove large renal tumors by urologists (4). In the modified Makuuchi incision, unlike the original version, the midline incision extends to the umbulicus, while the transverse incision is extended to the anterior or mid axillary line according to the preferred side in an L or inverted L shape. In our clinic, we learnt this incision by urologists. We present our preliminary results in six patients who were operated on using the modified Makuuchi incision for large abdominal tumors.

MATERIALS AND METHODS

We used modified Makuuchi incision in 6 pediatric patients with large abdominal tumors (right side in 1 and left side in 5) between January 2019 and August 2020. Patients' age ranged from 2 to 17 years (mean age 8.58 year). Characteristics, demographics and surgical informations in our patients are shown in Table I.

This incision consists of 2 parts. First part of the incision is midline from the lower part of xyphoid to 1 cm just above the umbilicus over linea alba. No muscle cut is made in this part. Second part is a transvers incision starting from lower point of midline incision. Rectus abdominis, external oblique, internal oblique and transvers muscles are cut up to the tip of the 12. rib according to the tumor side (Figure 1, 2). After suturing a large triangle musculocutaneous flap to anterior chest wall, perfect exposure is obtained for easy access to the mass, large vessels and midline structures. After removal of the tumors, the median of the upper part is closed with a single row and the transverse part is closed with 2 rows of 2/0 to 1 number vicryl or polydioxanone sutures according to patient's age. While a drain in one patient who underwent hepato-

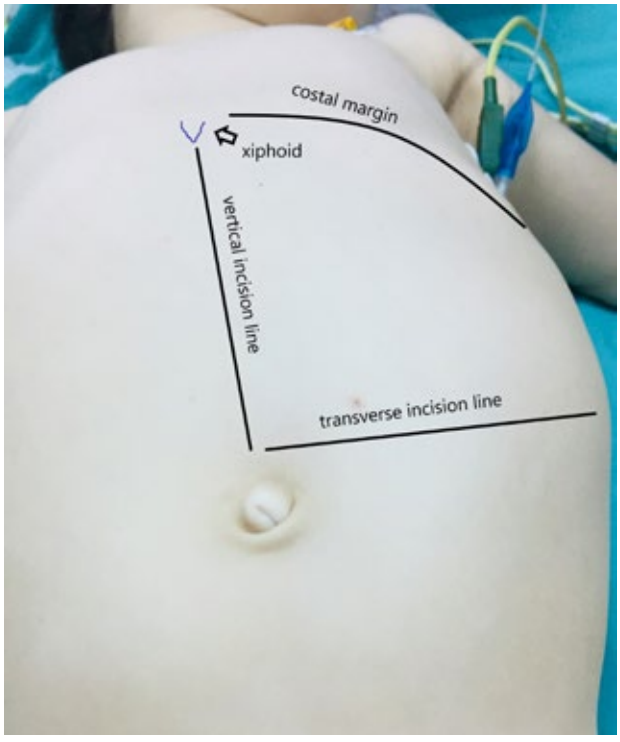

Figure 1: Description of the modified Makuuchi incision.

Figure 2: Modified Makuuchi incision in our sixth patient in table 1.

blastoma resection was placed in the subhepatic area, the other patients did not require a drain.

RESULTS

Complete mass excision was successfully performed in 5 patients. All of these cases were patients who had previously received chemotherapy within their protocols, 4 of them were referred to our clinic and the masses had close proximity and adhesions with vital structures and organs such as vena cava inferior, aorta, renal vessels, intestine, spleen, kidney, pancreas. There were minor hemorrhages that required suturing to the aorta and vena cava without the need for major vessel repairs such as grafts in 3 cases. These procedures were easily performed with this incision. In addition, in a 3-year-old child, left surrenal neuroblastoma (left kidney completely in mass and could not clearly separate), splenic vein, pancreas, spleen, and diaphragm adhesions were separated and this organ was preserved and completely en bloc removed with this incision (Figure 3). Incomplete resection as a debulking surgery was done in one patient (Table I). In this patient, the mass originating from the right surrenal located anterior kidney, renal vein between the inferior vena cava and aorta junction was also incompletely removed, leaving behind some part surrounding the superior mesenteric artery and the pancreatic head. While Patient-controlled analgesia with morphine was used for pain management for 2 days in all patients, as in other incisions. it was observed

Figure 3: Left huge adrenal tumor in same patient in computed tomography.

that our patients tolerated this incision easily. They mobilized earlier and easier. Seroma was observed in only 2 patients and it resolved spontaneously. No wound infection, hernia or dehiscence was observed during a mean follow-up of 9.6 months (3-18) months. Early discharge was provided by oral administration on the second postoperative day in our patients.

DISCUSSION

This is the first study using this incision in the surgical treatment of large abdominal tumors in pediatric patients. Pediatric surgeons are familiar to use vertical, transverse, oblique, or thoraco-abdominal incisions in the pediatric patients with large intra-abdominal masses. While in younger patients the flexibility of the abdominal wall allows for a succesful operation with conventional incisions, such a wide exposure in toddlers and adolescent could prove to be beneficial, especially in tumors of unfavorable and diffucult localizations. The conventional incisions sometimes do not allow deep or wide field interventions due to

No	Gender/Age (years)	Diagnosis of tumor	Tumor size(cm)	Side of incision	Surgical procedure	Complications
1	Male/2	Fetal pattern Hepatoblastoma Epithelial type	11.5X10	Right	Right regular hepatectomy	Seroma and vena cava suturing
2	Female/7.5	Ganglioneuroblastoma intermix type	6X4	Left	Left adrenalectomy	-
3	Female/17	Extraadrenal paraganglioma moderate differentiation	5X4 pelvic and 2x1.5 adrenal	Left	Left adrenalectomy + pelvic mass excision	-
4	Male/5	Ganglioneuroblastoma intermix type	8X8	Right	Right adrenalectomy (tumor debulking)	Seroma, aorta and vena cava suturing
5	Male/17	Ganglioneuroma schwannian stroma dominant	13X12	Left	Left adrenalectomy	-
6	Female/3	Neuroblastoma schwannian stroma poor renal paranchimal and vascular infiltration (+)	15X12	Left	Left adrenalectomy+ nephrectomy	Vena cava suturing

Table I: Characteristics, demographics and surgical informations of our tumor patients operated with Modified Makuuchi incision.

the two-dimensional approach. For these reasons, it causes prolonged operation times, bleeding, bowel damage and pain due to the use of retractors after the surgery. The modified Makuuchi incision offers a three-dimensional approach and wide exposure to the selected abdominal guadrant unlike the other incisions mentioned above. While these approaches damage the abdominal wall integrity, they do not allow deep or wide field interventions due to the two-dimensional approach. The modified Makuuchi incision offers a three-dimensional approach unlike the other incisions described above (1-3).

In addition, this incision provides wide exposure to the selected abdominal guadrant, while allowing the intestines and other organs to remain closed with the abdominal wall without leaving the incision. While liver and kidney tumors or intraabdominal masses are made almost completely visible and easily dissected with this incision, other organs are not included in the operation area. After this incision, when the colon is pulled medially and down on the right and left, almost only the solid organ or tumor remains in the surgical area, thus minimizing the contact time of the viscera and intestines with air, sponge and retractor, reducing the damage or ileus of the intestines and causing early postoperative bowel movements (1-4). Modified Makuuchi incision described in our operations, large midline structures such as aorta, vena cava, and renal vessels, lymph nodes are in a position to be intervened more ergonomically and simply unlike vertical or transverse incisions. In patients 2 and 4, modified Makuuchi incision was preferred in order to gain a better exposure of large vessels which the tumors were closely associated and suturing of the vessels was required in case 4. As in our patient number 3, it provides a field of view that allows both the pelvic and adrenal mass to exit through the same incision in the adolescent patient. In addition, closing this incision is quick and easy.

This incision is becoming popular among the urologists and general surgeons (1, 3, 4, 6). Panditt et al stated that modified Makuuchi incision proves efficacious for major upper abdominal surgeries (1). In a recent study by Bokka et al, The modified Makuuchi incision was used for complex renal and adrenal surgeries (6).

The incisional hernia rate was reported as 12-23% in the literature for Makuuchi incision (3, 7). No incisional hernia was observed in our patients as shown in Polat et al study (4). Additionally, this incision wase well-tolerated by children and there was no exaggerated analgesic use after postoperative period. The limitations of our study are retrospective nature, low number of the patients and no control group. It is not realistic to claim that this incision is the only and the best incision for surgical treatment of intraabdominal tumors in pediatric patients. The aim of this study is to show that this incision can be used in pediatric patients who will be operated for intraabdominal tumors.

CONCLUSION

According to our first experience, this incision appears to provide a very good exposure of the operation field, shorten the operation time, decrease in complications and start early bowel movements in children with large intra-abdominal tumors. Additionally, this is well-tolerated by children and has good cosmetic results.

CONFLICT OF INTEREST: ALL AUTHORS DECLARE NO CONFLICT OF INTEREST.

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