

# Traumatic Hemipelvectomy before Body Image Has Developed

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## Abstract

Traumatic hemipelvectomy is rarely observed because very few patients have survived from the initial trauma. We describe one male child who survived from this massive trauma with a good functional outcome. The boy was 28 months old when he was accidentally struck by a truck. He had severe open trauma of the pelvis and hemorrhage of the left lower limb. Amputation of the left hemipelvis, colostomy, cystostomy and removal of the left avulsed testicle were performed. Once healing had been achieved, he was transferred to our Department of Physical Medicine and Rehabilitation and rehabilitative management was begun, including prosthetic measurement and psychologic intervention for the patient and his parents. For 13 years of long-term follow-up, his prosthesis was readjusted annually. Now he is a 16-year-old middle school student. He is functioning remarkably well with a prosthesis. The psychologic report shows that he is emotionally stable and has good scholastic performance. Although hemipelvectomy appears to be a radical procedure in children, the potential for rehabilitation in a group of children before body image has developed appears to be unexpectedly good.

**Key Words:** Traumatic hemipelvectomy, pediatric amputation, rehabilitation, prosthesis

## INTRODUCTION

Traumatic hemipelvectomy is an uncommon clinical experience. The first reported survivor of a hemipelvectomy was in 1960.<sup>1</sup> According to one report, only 36 cases of traumatic hemipelvectomy were reported in the 19th century.<sup>2</sup> Another report showed hemipelvectomy patients comprised 0.5 percent of the child amputee population, but all cases were from acquired injury such as operation for malignancy.<sup>3</sup> Massive trauma to the pelvis and pelvic organs is a life-threatening injury that requires rapid resuscitation, surgical intervention, and critical care monitoring. Improved emergency care techniques and facilities will result in the salvage of an increasing number of persons who have sustained traumatic injury of the pelvis. Although the technique of hemipelvectomy has been adequately described, little is known about its long-term follow-up and late results in pediatric amputees. We thought it would be interesting to investigate a pediatric amputee who lost a limb or limbs before he or she had a fully-developed body image, including the final functional outcome, prosthetic utilization and emotional status. Also, examination of the psychosocial

outcome including school performance, activities and overall attitude of this patient and his family would help to guide the counselling of new patients and their families.

Previous reports<sup>1,4-6</sup> and this patient's report suggest that the rehabilitative potential is surprisingly good for young male patients, even if they are in a pediatric age group. This report describes the management of the youngest known survivor following traumatic hemipelvectomy.

## CASE REPORT

A 28-month-old boy was involved in a traffic accident, being struck by a 4.5ton truck on December 23rd, 1986. He was immediately brought to the emergency room at Youngdong Severance Hospital, Yonsei University College of Medicine and he was transferred to our hospital after emergency care. There was a large laceration just above the level of the left inguinal ligament with considerable bleeding. The left hemipelvis was freely mobile. The penis was intact, but the scrotum was opened, exposing the left testicle. The rectum was lacerated. The left lower limb was pale and pulseless with complete motor and sensory loss. The right lower limb was grossly normal. He was diagnosed as having cerebral contusion, crushing injury on the left inguinal area, open comminuted fracture in the left pelvic bone, left sacroiliac joint separation and displacement, left internal and external

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iliac artery and vein rupture, perineal laceration and anal sphincter rupture and transected rectum, and left testicle and ureter injury. The child was resuscitated with a transfusion and debridement, but stabilization of the pelvis and revascularization of the left leg was not feasible because of uncontrollable hemorrhage from the massive injury. Initially the patient's parents refused amputation, but the performance of a hemipelvectomy was necessary to control exsanguinating hemorrhage. Once the hemipelvectomy was completed, bleeding from the sacral and pelvic veins was easily identified and controlled. Right transverse colostomy and removal of the left avulsed testicle were performed. Urethrocuteaneous fistula had developed by 21 days postinjury and secondary closure of the wound and suprapubic cystostomy was performed. Debridement and skin graft for skin defect on the left hemipelvectomy area were done on postinjury day 27. By postinjury day 77, the patient was transferred to the Department of Physical Medicine and Rehabilitation and began comprehensive rehabilitative management. Preprosthetic rehabilitative programs were started including strengthening exercises, maintaining joint mobility, one-limb balancing and walking between parallel bars, as well as psychological counselling. His first prosthesis was designed similar to a Canadian-type of prosthesis, but some modifications were necessary for the socket. The socket was extended to his lower chest with a funnel shape, and weight bearing was made possible by the lower rib cage. There were two holes in front of the socket: one hole was for colostomy care on the right lower quadrant of the abdomen and the other was for suprapubic cystostomy care on the left side. With intensive rehabilitative training, using a prosthesis and bilateral

crutches enabled the boy to ambulate independently and perform the activities of daily living like a normal children of the same age. By 17 months after injury he had undergone fistulectomy and transperineal urethroplasty for the urethrocuteaneous fistula, and therefore the suprapubic cystostomy was repaired. His prosthesis socket was redesigned according to this change. He was discharged home 22 months after injury. Three years later, he returned to the hospital for further operative revision, including repair of the transverse loop colostomy, sigmoid end colostomy, Pickrell's operation and mucolysis for prolapsed colon of the anus. He needed adjustment of the prosthesis socket according to the change of colostomy site from the right to the left side.

For 13 years of long-term follow-up, the boy's prosthesis was readjusted annually according to his growth. He is now a 16-year-old middle school student. In spite of left lower limb loss and his colostomy, he is functioning remarkably well with his hemipelvectomy prosthesis (Fig. 1 and 2). He is able to walk for a short distance on a level surface without the support of crutches and perform some sport activities such as football and basketball using one crutch or leaning against a wall (Fig. 3 and 4). Psychological evaluation reported that he was emotionally stable and had good scholastic performance. According to the report, his family's support was very important to his emotional stability.

## DISCUSSION

Traumatic hemipelvectomy is the result of unstable ligamentous or osseous hemipelvic injury with rupture



Fig. 1, 2. Appearance of the patient standing with and without prosthesis.



Fig. 3, 4. Active performance by a hemipelvectomy patient with a prosthesis.

of the pelvic neurovascular bundles.<sup>7</sup> Seventy-nine percent of related accidents involved a motor vehicle, with the remainder involving industrial machinery.<sup>2</sup> Most survivors are young, healthy individuals who are able to tolerate massive hemorrhage and soft-tissue destruction. Numerous severe associated injuries are common. Sigmoid colon, rectum, urethra and testicular injuries have also been present in 50 percent of cases.<sup>8</sup> The severity of associated genital injuries appears to have the greatest impact on long-term psychologic adjustment. The lower limbs, although partially avulsed, should be amputated if they are insensate, immobile, pulseless or there is an inability to achieve hemostasis. Immediate completion of an amputation has a number of advantages. It provides the wide exposure necessary to achieve hemostasis and allows assessment and management of commonly-associated injuries to the rectum and lower genitourinary system.<sup>7</sup>

Douglas et al. reported, based on 50 hemipelvectomies for malignant tumors, that the prosthesis was cosmetic rather than functional and it was accepted by only a few patients.<sup>9</sup> He mentioned that patients had considerable difficulty in wearing a prosthesis because they felt it was too heavy or unwieldy. Apffelstaedt et al. reported, among 68 hemipelvectomized survivors, that only three patients reported that they had used a prosthesis daily.<sup>10</sup> Their mean age was 48 years and all patients had undergone hemipelvectomy for malignant tumors. According to the author, external hemipelvectomy for a tumor is a procedure with considerable postoperative complications and it should be recommended for only a few far-advanced tumors. However, these results were quite different from traumatic hemipelvectomized patients, especially young adults and pediatric patients. Beal and Blaisdell reported that 89 percent of survivors of traumatic hemipelvectomy ambulated with either crutches or a prosthesis and that 32 percent of patients had returned to gainful employment.<sup>2</sup> Some patients also resumed other activities such as swimming, jogging, riding a bicycle, and driving a car.

In our case, commonly encountered problems such as the extensive need of split-thickness skin grafting and colostomy did not interfere with the fitting of a prosthesis. The patient started gait training between parallel bars and was taught how to use a prosthesis beginning on post-injury day 77. Because a large amount of tissue is in contact with the socket, skin care and tolerance are of great importance and require constant observation for abrasions and reddened pressure areas. The type of underwear between the stump

and socket was important. Special rubber (P-E lite, Otto Bock Orthopädische Industrie GmbH & Co, Duderstadt, Germany) was the most comfortable underwear for this patient. Lack of adequate weight-bearing structure requires extensive weight distribution. This was achieved by using a plastic laminated molded body socket with weight bearing distributed to the lower rib cage. Crutch gait walking was started when he was able to stand on his leg and prosthesis equally. According to Fbist and Davis, young and active hemipelvectomized patients particularly learn quickly to manage their prosthesis once balance has been regained and they are able to tolerate the hardware and manipulate the artificial joint.<sup>11</sup> On discharge, our patient did all his own self-care, put on the prosthesis without help, and was totally independent in transfer activities. He followed up for 13 years and had his prosthesis readjusted annually. Now his prosthesis is built with a modified Canadian-type hip joint, polycentric knee, multiaxis ankle-foot assembling and endoskeletal type of construction (Fig. 3). The annual follow-up and modification, the thoughtful prosthesis design, and the patient's high motivation have permitted maximal rehabilitation effects.

The most common complications after hemipelvectomy have been intractable pain-phantom limb, skin



Fig. 5. Right thoracolumbar scoliosis: The Cobb's angle at T9-L4 measured 20 degrees.

flap necrosis, systemic sepsis and vesico- or urethrocutaneous fistula. Permanent bladder or bowel incontinence or sexual dysfunction have been rarely reported.<sup>2</sup> In this case, urethrocutaneous fistula developed by 21 days post-injury. After initial suprapubic cystostomy, fistulectomy and transperineal urethroplasty were successfully performed. To prevent skeletal deformities such as scoliosis, he initially learned scoliosis exercises. The scoliosis secondary to pelvic obliquity was evaluated recently by X-rays using Cobb's method of measurement.<sup>12</sup> The Cobb's angle at T9-L4 measured 20 degrees when the patient was standing (Fig. 5). Pulmonary function test was within the normal range.

The loss of limb through amputation represents a potentially major psychological trauma for a child and this has implications for his or her developing body image and sense of mastery.<sup>13</sup> Several case reports have commented on prostrated courses of drug dependence and severe psychologic problems.<sup>1,14-16</sup> Amputation also creates extreme stress in all participants including the patient, family and members of the treatment team.<sup>17</sup> Early psychologic consultation and intensive rehabilitative management are important for the desired outcome. This patient was too young at the time of injury and did not show any body image conflicts such as depression, guilt, projection, and scapegoating. However his parents suffered from very strong feelings of guilt, denial, anger, and depression. So, psychologic counselling was planned concerning ways to facilitate the coping and adjustment of the patient and to decrease the parents' feeling of guilt. His parents quickly passed through the stage of denial and became very cooperative and assumed an active role in their child's rehabilitation. As the patient grew, adjustment for limb loss and social coping skills were taught. He was recently referred to a psychologist for follow-up to evaluate cognitive function and emotional status. His Intelligence Quotient (IQ) score on the Korean-Weschler Adult Intelligence Scale (K-WAIS) suggested that he functions in the above-average range of general intellectual ability. Minnesota Multiphasic Personality Inventory (MMPI) results suggested that the patient was emotionally stable without neurotic or psychotic symptoms. He appeared to have a very positive attitude and to be well adjusted to his physical deficit. However he showed a somewhat delayed male sexual identity in a House-Tree-Person drawing test.

Successful management of patients with traumatic

hemipelvectomy usually requires an extraordinary effort and cooperation from a team consisting of the physiatrist, general surgeon, orthopedist, urologist, psychiatrist, psychologist, physical therapist and nursing personnel. As this case and reviews show, many radically-hemipelvatomized pediatric patients from trauma can be successfully rehabilitated to an active and productive role in society.

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