

Multidisciplinary Rehabilitation Approach for Adolescent Osteosarcoma: A Case Report

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Introduction:

Osteosarcoma, a primary bone malignancy predominantly affecting adolescents, presents unique challenges in its diagnosis and management. This case report documents the journey of Mukesh, a 14-year-old boy diagnosed with osteosarcoma of the left distal femur following a soccer injury.

Mukesh's initial presentation with leg pain led to a delay in diagnosis, initially attributed to a left hamstring strain. However, persistent symptoms prompted further investigation, revealing a large mass necessitating a biopsy and subsequent confirmation of osteosarcoma.

Following diagnosis, Mukesh embarked on a comprehensive treatment plan, including neoadjuvant chemotherapy and a limb-sparing surgical procedure utilizing an expandable endoprosthesis to accommodate his growth. Throughout his treatment, Mukesh received intensive physical therapy interventions to optimize functional outcomes and facilitate his recovery.

This case report outlines Mukesh's physical therapy assessment, diagnosis, prognosis, and rehabilitation goals, which were collaboratively determined with his family and healthcare team. The multidisciplinary approach involved addressing Mukesh's pain, decreased strength, mobility limitations, and functional impairments.

Despite challenges such as neuropathic pain and decreased mobility, Mukesh made significant progress with targeted physical therapy interventions. His rehabilitation journey involved various modalities, including continuous passive motion (CPM) therapy, gait training, and therapeutic exercises to improve range of motion (ROM) and strength.

Throughout his rehabilitation process, Mukesh encountered setbacks such as surgical complications and the need for prosthesis adjustments. However, with consistent physical therapy and ongoing medical management, he achieved remarkable improvements in functional mobility and quality of life.

This case report underscores the importance of a comprehensive rehabilitation program in addressing the complex needs of adolescent osteosarcoma patients. By integrating physical therapy into the treatment continuum, healthcare providers can optimize outcomes and enhance the overall well-being of patients like Mukesh.

Case Description:

History Mukesh, a 14-year-old boy with no significant medical history, presented to his paediatrician with leg pain after a soccer injury. Mukesh's physician referred him to the physical therapy department for treatment of a left hamstring strain, three times a week for 6 weeks. After 2 weeks, the physical therapist noticed that Mukesh's condition was not improving and called the physician. The physician ordered a CT scan of Mukesh's left lower extremity; imaging results indicated a large mass. The physician then ordered a biopsy of the mass; based on the results, he diagnosed Mukesh's condition as osteosarcoma of the left distal femur. Mukesh had no signs of metastatic disease. Mukesh lives in a large metropolitan city with a well-known children's hospital, where he is scheduled to begin 3 months of neoadjuvant chemotherapy (ifosfamide, carboplatin, and doxorubicin). Mukesh went to one session of physical therapy to review training on how to use forearm crutches for a non-weight-bearing left lower extremity. Previous physical therapy had consisted of training on the use of axillary crutches and left knee AROM exercises. A central line was surgically placed. After 10 weeks of chemotherapy, Mukesh was reevaluated by his orthopaedic surgeon and oncologist. Mukesh, his family, and the doctors agreed that Mukesh would receive a limb-sparing procedure, specifically an

expandable endoprosthesis because Mukesh is still growing. After the surgical procedure, the physician requested that the physical therapist provide Mukesh with a continuous passive motion (CPM) machine in the surgical recovery room. The physician also requested that physical therapy services start on postoperative day 1 for functional mobility training, left knee ROM therapeutic exercises, and family education. Mukesh's blood test results were WNL on postoperative day 1 (WBC 10.2 [normal range, 4.2 to 12.2/mm³]; RBC 4.75 [normal range, 4.50 to 5.30/mm³]; Hbg 14.2 [normal range, 12.5 to 16.5]; platelet 250,000 [normal range, 170,000 to 430,000]) (St. Jude Children's Research Hospital normal blood value ranges for a 16-year-old boy). Social History Mukesh lives at home with his mother and two younger brothers. He is in the eighth grade in school and enjoys playing soccer and basketball and motorcycle riding. Mukesh's mother has a full-time job outside the home, and he sees his father only once every few months.

Physical Therapy Systems Review

When the physical therapist arrived in Mukesh's hospital room, he was in bed. A Foley catheter, central venous line, and pain pump had been placed. He was receiving an analgesic through an epidural catheter in his lumbar spinal area to assist with lower extremity pain management. His mom and both brothers were present. Mukesh was alert and oriented, but reluctant to begin physical therapy.

Physical Therapy Tests and Measures

Mukesh presented with full active ROM in his neck, upper extremities, and right lower extremity. Mukesh's CPM had been set at 0 to 45 degrees of motion after his surgery the previous night, and the settings had not been changed. The therapist removed Mukesh's left leg from the CPM and performed gentle passive ROM exercises; the left hip and ankle demonstrated a full ROM and 50 degrees of left knee flexion. He had decreased trunk mobility due to the placement of his epidural catheter. His strength was 5/5 as measured by manual muscle testing in bilateral upper extremities and right lower extremity. Mukesh's strength in the left lower extremity was limited because of pain and fear of movement. With moderate assistance for support of Mukesh's left lower extremity, he flexed his left hip to 90 degrees and actively dorsiflexed his left ankle to the neutral position. He followed directions spoken at a normal voice level. He had lost sensation to light touch in his bilateral lower extremities owing to the effects of the epidural. Mukesh reported pain in his left lower extremity as a 3 on the 0 to 10 self-report scale. His incision was covered with dressings. Mukesh required minimal assistance to protect the epidural while transferring from a supine to a sitting position in his bed. He required maximum assistance for support of his left lower extremity to scoot to the edge of the bed. The physical therapist placed a hinged knee brace, which was locked in extension, on Mukesh's left lower extremity before Mukesh got out of bed. With the brace locked in full-knee extension, Mukesh then transferred from sitting on the edge of the bed to standing by using his forearm crutches. He required minimal assistance for balance and maximum assistance for support of his left lower extremity to maintain non-weight bearing. Mukesh ambulated 5 feet to a chair in his room and transferred from standing to sitting with maximum assistance for support of his left lower extremity.

Physical Therapy Diagnosis

- Nociceptive pain from the surgical site
- Neuropathic pain from nerve damage during surgery
- Decreased strength from change in alignment of the muscle pull
- Increased energy expenditure with functional activities such as walking
- Decreased functional mobility due to pain, limited strength and balance, and nausea from the anesthesia
- Decreased participation in school, sports, and socialization with friends

Physical Therapy Prognosis Mukesh's strength and functional mobility are expected to improve. He may continue to lack full-knee extension secondary to the changes in the biomechanical alignment of his knee structure. Goals as Determined with Mukesh and His Family Mukesh will transfer from a supine position to sitting independently (the same day his epidural catheter is removed). Mukesh will transfer from a sitting to a standing position with forearm crutches and non-weight bearing on the left lower extremity, with standby assistance (3 days). Mukesh and his mother are able to independently use the CPM and don and doff Mukesh's lower extremity brace. Mukesh

will independently ambulate 50 feet with forearm crutches and non-weight bearing on left lower extremity (4 days). Mukesh will ascend and descend 12 steps with one hand on the rail and one hand on a forearm crutch, non-weight bearing on left lower extremity with contact guard assistance for safety (6 days).

Plan of Care

Mukesh will receive physical therapy daily while in the inpatient unit. After he is transferred home, he will return for outpatient physical therapy five times a week for 1 month, and then be followed up once a week to make modifications to his home exercise program.

Physical Therapy Client-related Instruction

The physical therapist will provide Mukesh and his mother with instruction on the use of his equipment, exercises, and safety. Activity: Instruction on use of the CPM and how to increase the ROM by 10 degrees each day Activity: Instruction on donning and doffing the lower extremity brace, which Mukesh is to wear when getting out of bed and during ambulation Activity: Instruction on active left lower extremity ROM exercises Activity: Transfer training Activity: Gait training on non-weight-bearing left lower extremity Physical Therapy Procedural Intervention The physical therapist will provide Mukesh with manual guidance, tactile cues, and oral instruction to achieve his goals.

Episode of Care

Mukesh was discharged from the hospital on postoperative day 5. He began outpatient physical therapy 2 days after his discharge from the hospital. He reported pain as a 6 on the 0 to 10 numerical scale; therefore, the physical therapist called the pain team working with Mukesh, and the team increased his short-acting pain medication. He delayed resumption of chemotherapy until 3 weeks after surgery to allow his surgical incision time to heal. Therefore, the physical therapist had to check the computer during each session to check Mukesh's blood counts to determine the appropriate physical therapy intervention for that day.

For example, if Mukesh's platelet count was less than 50,000, he would not use weights for strength training in view of the increased likelihood of hemorrhage. Instead, he would perform active ROM exercises for stretching his left knee. After 6 weeks of outpatient physical therapy that included strengthening and stretching exercises, Mukesh achieved 100 degrees of passive left knee flexion and 92 degrees of active left knee flexion. He had a knee extension lag of approximately 20 degrees. Mukesh's full active ROM in his left knee was 20 to 92 degrees of knee flexion. His left lower extremity strength was hip flexion/extension and abduction/adduction 5/5, hip internal rotation 4-/5, hip external rotation 4/5, knee extension 3+/5, knee flexion 4-/5, and ankle dorsiflexion/plantar flexion/inversion/eversion 5/5. Mukesh's orthopedist approved full weight bearing on his left lower extremity. Therefore, gait training and exercises to help Mukesh shift onto the left lower extremity were added to the physical therapy sessions, which continued to be focused on ROM, strength, and weight. Mukesh used the CPM for 6 weeks at night only. When he was not performing his exercises during the day, he wore his knee brace unlocked to continue to work on increasing his knee flexion ROM. After he completed the use of the CPM, Mukesh wore his knee brace at night locked in full extension to assist him in preventing the development of a knee flexion contracture because he still did not have full active knee extension ROM. After 1 month of physical therapy five times a week, Mukesh's sessions were decreased to once a week because he was independent in his exercise program and was showing signs of progress. He had achieved active knee flexion to 110 degrees and continued to lack 10 degrees of active knee extension to achieve full extension. He ambulated with a mild lateral trunk deviation to the left; however, with oral cues, he could ambulate with his trunk in the midline position. He could ascend and descend 12 stairs, alternating feet to step slowly with his hand on the rail for minimal support. Mukesh now wore the lower extremity brace only to sleep in at night, and he wore a small knee brace during the day to provide tactile cues and comfort to his left lower extremity. Eight months after Mukesh's surgery, he completed his chemo therapy. Mukesh and the physical therapist noticed he had increased trunk flexion to the left. Mukesh had grown over the past 8 months.

As a result, his prosthesis needed to be lengthened. After it was lengthened, Mukesh's left lower extremity was sore, and he required gentle knee ROM exercises and the use of crutches for 2 days. He then returned to his normal pre-lengthening functioning. Twelve months after Mukesh's surgery, he came to the physical therapist once every 3 months for checkup visits. He had returned to school and was planning to swim on his high-school swim team.

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