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CASE REPORT PEER REVIEWED | OPEN ACCESS

Physiotherapy management of chemotherapy induced peripheral neuropathy in a gynecological condition through clinical reasoning process: A case study

K. M. Amran Hossain, Mohammad Anwar Hossain, Feroz Ahmed Mamin, Ehsanur Rahman, Nasrin Afroz, Nusrat Jahan Sonia, Shati Aziz Khan

ABSTRACT

Introduction: Gynecological cancer survivors completing chemotherapy has a diverse presentation of pain, neurological disturbances and functional impairments that constitutes several impairments in ICF framework that hinders optimum quality of life. The study intended to determine the impact of Physiotherapy interventions through clinical reasoning procedure by international classification of functioning, disability and health (ICF). Case Report: The case was a uterine carcinoma case completing surgery & chemotherapy and seeks Physiotherapy complaining lower back pain, numbness & decreased strength in both lower limbs with functional and psycho-social impairments. The patient has been managed in three tract reasoning & Hypothetco deductive reasoning process of clinical reasoning. The Interventions focused on strengthening exercise of lower limbs, pelvic floor exercise, aerobic exercise and exercise to improve balance. After two weeks, Mckenzie extension approach for lumbar spine and neural sliding of lower limbs has been added as adjacent therapy. Treatment has been provided for eight sessions in four weeks and continued home exercises for another four weeks. Outcome has been measured and found positive effects on in pain redaction, remission of numbness, improvement of balance, strength of lower limb and quality of life measure.Single session follow up after three months from screening revealed sustainability of improvements that reflects efficacy of physiotherapy interventions in diverse indicator in ICF framework. Conclusion: Chemotherapy induced musculoskeletal complications are certainly manageable through physiotherapy interventions and McKenzie extension approach found effective to remission of lumber radicular symptoms in CIPN. The interventions have positive effect in longer run and upon quality of life in gynecological cancer survivors.

Keywords: CIPN, Gynecology, ICF, Physiotherapy

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INTRODUCTION

Uterine cancer is one of the leading cancers of female population worldwide. United States has forty thousand diagnoses each year [1] and in Bangladesh cervical cancer has prevalence of 26.1% second in leading cancers in women [2]. Seretny avowed that [3] several chemotherapeutic agents are being used in uterine cancer and the one third to more than half of the population receiving chemotherapeutic treatment develops peripheral neuropathy. Brown states [4] cervical cancer has associated long term impairment in physical function alongside disturbance in daily leaving activities including walking and working in standing position. Oh and Kim had a meta-analysis [5] that exposed, several physical impairments is being manifested in Chemotherapy Induced Peripheral Neuropathy (CIPN) including pain, sensory disturbances, decreased balance in lower extremities, decrease strength of limbs, functional impairments, psychological disturbances and alteration in aerobic function. Hence, structured exercise program has significant positive impacts upon these impairments.

Management of diverse physical impairments, health professionals' clinical reasoning skills play crucial role. Clinical Reasoning is the key component of medical practice, and educators agreed that it has a greater impact on medical documentation, education, health service management and innovation for the society [6].

CIPN has a long term affect in physical functions leading to disability and can compromise survival [7]. To determine the health related state and diverse limitations, the international Classification of Functioning, Disability and Health (ICF) stand for the integrated state of disability in a structured framework. ICF reflects several domains of health related state by enlisting the body structure & function, activity limitations, participation restriction, environmental and personal factors that hinder a person in life situations [8]. The CIPN case presented in the study correlates the stated impairments and has been managed in accordance with standard protocol of care by Physiotherapy in Gynecology & Women's Health subspecialty.

CASE REPORT

Case description

The patient was 45-year-old teacher separated from family,diagnosed as uterine carcinoma and completed hysterectomy followed by several session of chemotherapy and two sessions of radiotherapy in one year. After completing medical management, in discharge file of Specialized Hospital in India, the diagnosis was chemotherapy induced peripheral neuropathy and had been referred to physiotherapist.

Baseline assessment

Managing a person with any form of disability is a multi- directional and comprehensive approach and ICF meets the requirement of understanding disability state for enabling person with disability with a better quality of life [9].

As impairments in body structure and functions, she appeared with complain of intermittent numbness in both lower limb provoking with standing and walking for more than 10 minutes. The symptom was progressive with intermittent non-specific low back pain, discomfort in taking classes for more than 40 minutes, with no disturbance in bowel and bladder function. The symptoms had no association with nocturnal episode or sign of pathology. The sensory abnormalities were related to lumber 5 and sacral 1 dermatome. On assessment, she had minimum decrease in lumber extension & both side gliding, no localized tenderness in spine, sensory impairment in lumber 5 and sacral 1 in right lower limb and lumber 5 in left lower limb. She also had decreased strength in pelvic floor muscles (3/5) & gross muscles of lower limb (4/5) measured through manual muscle testing procedure with diminished knee reflex in right lower limb. She had impairments in Balance (28 in burg balance scale), decreased single leg standing time (18 seconds) and lower lifestyle quality (60 in EORTC QLQ). She had an X-ray of lumbar spine reporting degenerative change in Lumber 2 to Lumber 5 vertebrae, with no other investigations available. The activity limitations include aggravated symptoms with activity and relieved with rest and lying down. She has difficulty in sitting more than 20 minutes, unable to ascend or descend vehicles (Rickshaw), difficulty to perform journey and daily sitting and standing activities. Thus, symptom interrupted her occupation and daily activities. She also presented several participation restrictions as difficulty to conduct lectures, attend for

physiotherapy, social gathering, political programs and her favorite morning walk. Her environmental factors hindering participation; the factors constituted job place was 30 minutes bus distance and physiotherapy center is 2-3 hours distance from her home. Moreover, her flat was in 5th floor. She visits the hospital where she continued cancer management once in three months and that was one hour air journey associated with 4 hours car journey. She was divorced, self-dependent & stays alone. Her only daughter lives abroad and she was unable to meet people though she wants to meet. She always found bodily malfunction as effect to cancer; she was depressed, worried & confused about how performing exercise can help her.

Provisional diagnosis

CIPN, National Cancer Institute Common Toxicity Criteria (1999 revised in 2006) version 3- Grade-3. Diagnosis was comprehensive with medical documents.

Three tract reasoning

Higgs stated that [10] clinical reasoning is the process of thinking and decision making associated with the practice of a professional. From clinician's perspective primarily the impairments enterprise as compensatory long time management and clinician decided to conduct three tract reasoning process to determine interventions in this case. Fleming described that, the therapist has three track minds [11]. Treating a person makes a clinician thought about his impairments, desire, thoughts, ambition and future perspective. In procedural part, clinician determined the management according to impairments and planned goals for interventions. The short-term goal included management of intermittent spinal pain, normalize numbness and feeling of heaviness in the lower limb, improve muscle strength of pelvic floor and lower limbs, manage associated joint integrity and function of lower limbs, improve balance strategy, improve functional impairments. The long-term goal included improving optimum balance strategy, improve control of locomotion and higher functional transitional movement ability, improve accessibility and psychological state and encourage livelihood activities and improving quality of life.

First line interventions

In managing the patient both Interactive and Conditional Reasoning had been applied. The management protocol included patient education, stretching exercise, strengthening exercise, stabilization exercise, Balance exercise & Aerobic exercise as described in appendix 1, table 1, twice a week for 4 weeks in physiotherapy session and practiced every day at home for one month. The interventions have been determined by shared decision with client and the future image of anticipated outcome has been demonstrated during session. Although, as a conditional part, patients appointments has been arranged in regular intervals by authorities concern and according to patients priority. Sometimes, physiotherapist discussed with her daughter through internet to deal with psycho-social impairments

Appendix-1: First line Management

Interventions	Description
McKenzie Extension Protocol	Repeated Extension in lying and standing, 10 repetition, 2 hourly for 7 days and then 10 repetitions, thrice a day for two weeks.
Sliding Technique of Sciatic Nerve [12]	Sliding technique for the sciatic nerve incorporating hip and knee flexion followed by hip and knee extension, 5 times, twice in a week for two weeks
Education	Education to the patients regarding peripheral neuropathy, its consequence and the anticipated outcome and the role of physiotherapy.
Stretching [13]	Stretching exercise had been introduced in lower limb 20 seconds, 6 repetitions, twice daily, not exceeding 15 minutes, twice a week in session and associated active stretching at home.
Strengthening Exercise [13]	Strengthening exercise has been demonstrated as strengthening of lower extremities, starting with multi-angle isometric to open chain progressive resistance exercise. The strengthening program in closed kinetic chain has been added as a consequence to improve collective strength and improving proprioception. Strengthening program for 20 minutes per session, twice a week with home advice
Stabilization Exercise [14]	Postural stabilization exercises, progressive stabilization of pelvic component and lumbo-pelvic segment, twice a week with home advice.
Balance exercise [14]	Structured balance exercise with progression in different surface and trampoline has been induced in managing associated balance and stability issues in CIPN. The dosage was 20 s exercise, 20 s rest for 3 sets, and 1 min rest between different exercises for 10 minutes.
Aerobic exercise [14]	Moderate intensity stationary bi-cycling has been induced 15 minute once per session, 2 sessions per week started after two weeks.

Table 1: Outcome of interventions

Variables	During Assessment	4th week	3 months
Pain after 10 minutes of activities	5/10	2/10	0/10
Pelvic floor strength	3/5	3/5	4/5
Manual Muscle Testing of Planter Flexion, quardiceps, hamstring, hip abductor and adductor, dorsiflexor and planterflexor.	4/5	4/5	4/5
Balance in Burg Balance Scale	28	30	38
Single leg standing time	18 seconds	45 seconds	50
Quality of life	60	68	72

of the client. Patient had a visit to oncologist in India after 4 sessions and there she got more appreciation and positive feedback. She feels difficulty to travel a long way, but she says- "I am coming with a new hope, every session and each time".

Hypothetico deductive reasoning

There were challenges in the case during two weeks of intervention at CRP. In this time there were positive changes in balance strategies and functional tasks. But the magnitude of low back pain andnumbness in lower extremities has not been changed in notable manner. The clinician decided to introduce hypothetico deductive reasoning with the help of senior colleague. Jones narrated clinical reasoning is a continuous process that goes on through the ongoing intervention procedure [15]. Hypothetico Deductive reasoning constitutes cue acquisition that involves recognizing related clinical information. After cue acquisition, hypothesis generation was the vital part of problem solving approach [16].

Firstly, the four cue questions included, how long was the low back pain? Was it present before chemotherapy? Are you absolute about the aggravating and easing factors? Is the numbness absolute with your indicative lower limb area? The intention was to explore the possibility of mechanical origin. She has a degenerative change in radiography and she said she is an affirmation in these questions. Secondly, to explore more, some cue questions added, that included; do you feel any change in cough or sneeze? Can you hold your urine during cough or sneeze? The aim was to find out dural involvement or any spinal entrapment. She said these questions have a negative answer. Based on cues the possible differential diagnosis determined, it could be associated with the pathological change in nerves due to chemotherapy or could be mechanical low back pain or a case of complex regional pain syndrome (CRPS). Interpreting cues to confirm hypothesis there was several thought. One, the symptom was responsive to activity and rest. Windebank & Grisold stated [17] almost all the chemotherapy induces mostly sensory disturbance and some causes motor weakness but there won't be any association with activity and rest. The A hypothesis has (-1) or no association. Two, the extension protocol of Mckenzie has been a positive impact on low back pain, but there were no changes in numbness. Adding neural mobilization in lower limb had a positive sign in decreasing lower limb numbness. So there reveals mechanical association, hypothesis B is (+1), affirmative. And third, the treatments were responsive to mechanical management, so there is no contribution of CRPS. Hypothesis C is (0), not contributing. So the source of Low back pain had been producing as a mechanical consequence and mechanical loading and directional movement had a positive impact on the low back symptoms. After 2 weeks, Mckenzie extension protocol in the management of lumbar spine and sliding technique for the sciatic nerve incorporating hip and knee flexion followed by hip and knee extension, 5 times, twice in a week had been administrated in addition. Schafer [12] conducted a cohort study concluding sliding technique in desensitizing the nervous tissue has positive impacts in decreasing symptoms in lower limb.

Intervention duration

Physiotherapy Interventions provided 8 sessions in 4 weeks at rehabilitation center adjacent to home exercise for another four weeks.

Outcome

Baseline measurements have been carried out in assessment date and evaluation after four week and follow up performed after 3 months of initial assessment through several tools and questionnaires. The measurement tools were subjective measurement of Pain determined by Numeric pain rating scale (NPRS), muscle strength of limbs and pelvic floor was measured subjectively by Manual Muscle Testing, Balance measured by Burg balance scale, Quality of life has been measured by EORTC QLQ-C30 (version 3) and Single leg standing time by mobile phone stopwatch.

Treatment setting

Patient was treated for four weeks from 1st March to 30th March, 2018 at Gynecology & Women's Health Unit, Centre for the Rehabilitation of the Paralysed (CRP). Treatment has been provided by a certified physiotherapist in Gynecology & Women's health. CRP is a well-known not for profit organization in Bangladesh for Rehabilitation of SCI patients. CRP (www.crp-bangladesh.org) is one of

the largest acute spinal rehabilitation centers in south-east Asia [18]. CRP-Mirpur has the only physiotherapy facility enriched with Gynecology & Women's health services in Bangladesh.

Ethical issues

Appropriate consent has been taken from patient to conduct the assessment and treatment. Ethical issues have been complied with Bangladesh Physiotherapy Association (BPA) practice guide complied with international standard determined by World Confederation for Physical therapy (WCPT). Also, the practice principle and required documentation determined by Centre for the Rehabilitation of Paralysed (CRP) has been complied in the study. Patient had full assurance of confidentiality and informed that she could leave the study anytime she wishes.

DISCUSSION

This is the maiden study exploring physical therapy intervention in chemotherapy induced neuropathy in a patient with uterine cancer in Bangladesh. The patient had some improvements in muscle strength, balance protocol and task related activities through conventional approaches, but the back pain responded with McKenzie extension approaches and numbness responded by sciatic nerve sliding techniques. Gheita explored [19] degenerative changes in bones manifests in post chemotherapeutic malignant cases and thus contributes musculoskeletal dysfunctions. That was the reason why mechanical corrections responded to pain in lower back and has shown aggravation with mechanical loading in symptom.

Brown elicited [4] that one third of the patients with female organ cancer have a decrease in lower limb functional activities including walking and staring. This is the reason why incorporating strength training, proprioceptive and balance strategy has been indicating positive sign. Yang stated [20] that pelvic floor strength decreases in gynecological cancer survivors and pelvic floor strength program has significant effect to improve lumbo-pelvic stability and decrease symptom in this cases. This was the reason why adding pelvic floor strength was beneficial in the study. Though there was no notable change in strength, objective balance and quality of life measures;there was overall progression in impairments and the entire disability state yet to be improved. In clinical reasoning, the narrative reasoning could be added to find better associations among experiences with similar conditions. Moreover, patient with similar criteria is difficult to find out with specific time frame. The sessions were less and if the patient continues physiotherapy, the quality of life can be upgraded with all these comprehensive efforts.

CONCLUSION

Gynecological patients with chemotherapy induced peripheral neuropathy improve with structured physiotherapy interventions focusing on symptomatic exercise prescription and mechanical correction. Physiotherapy services in Gynecology are newly introduced in Bangladesh and the service can significantly improve functional abilities of daily living, occupational performance and quality of life in gynecological cancer survivors.Further studies are recommended to elicit the effect of specific physiotherapy treatment approaches in CIPN patients.

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Author Contributions

K. M. Amran Hossain – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Mohammad Anwar Hossain – Substantial contributions to conception and design, Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Feroz Ahmed Mamin – Substantial contributions to conception and design, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Ehsanur Rahman – Substantial contributions to conception and design, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Nasrin Afroz – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Final approval of the version to be published

Nusrat Jahan Sonia – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Final approval of the version to be published

Shati Aziz Khan – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Final approval of the version to be published

Guarantor of Submission

The corresponding author is the guarantor of submission.

Source of Support

None.

Consent Statement

Written informed consent was obtained from the patient for publication of this case report.

Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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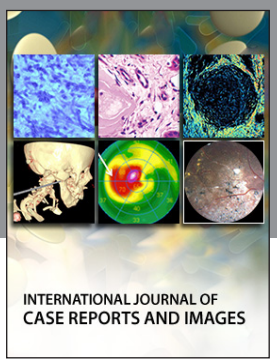

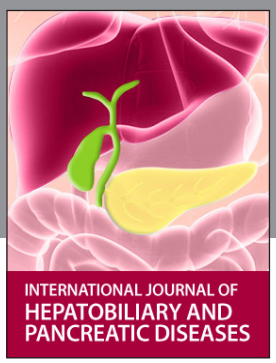

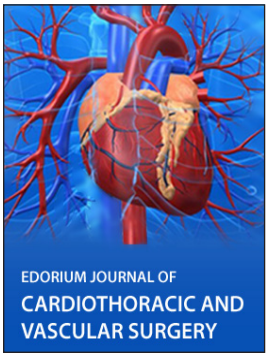

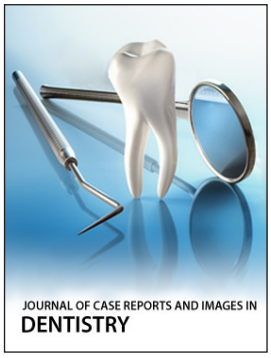

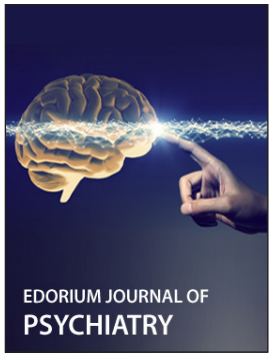

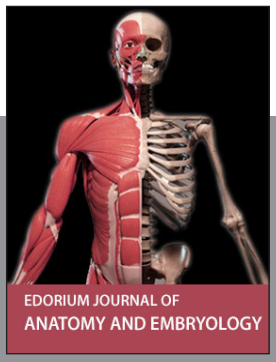

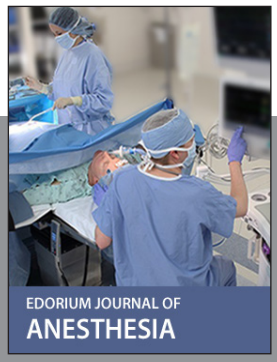

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