

Gender Influence on Musculoskeletal Ultrasound (MSUS) Finding among Patients on Maintenance Haemodialysis

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ABSTRACT

Background: Musculoskeletal disorders remain a major problem in long term haemodialysis patients. Musculoskeletal ultrasound (MSUS) represents the gold standard technique for articular and extraarticular assessment.

Objectives: Assessment the difference of MSUS finding among male and female haemodialysis patients.

Methods: Musculoskeletal ultrasound assessment of articular and extra articular tissues. Bone mineral assessment (serum calcium, phosphorus, PTH) and iron profile (Transferrin saturation (Tsat), Ferritin level).

Results: Fifty patients, mean age 52 ± 16 years, 31(62%) male and 19(38%) female, maintained on regular hemodialysis (three times/week) for 4.4 ± 3.8 years. Knee osteophytes with prepatellar effusion was the most common MSUS finding in 15/31 (48.4%) male patients while Sub Acromial Sub Deltoid (SASD) bursa and planter fasciitis were evident in 2/19 (10.5%) female patients, successfully ultrasound guided corticosteroid injection.

Conclusion: Soft tissue affection (SASD bursa, planter fasciitis and prepatellar effusion) more MSUS manifestation in female than male where knee osteophytes with prepatellar effusion is evident. No statistically significant difference of bone mineral assessment in both genders.

Keywords: Musculoskeletal ultrasound; Gender; Haemodialysis; Greater trochanteric pain syndrome; Knee effusion; Carpel tunnel syndrome; Tendinopathy; CKD-Mineral and Bone Disorder (CKD-MBD)

Abbreviations: CKD: Chronic Kidney Dialysis; CHD: Chronic Hemodialysis; PTH: Parathormone Hormone; HB: Hemoglobin Level; S.Ca: Serum Calcium; S.PO4: Serum Phosphorus; SASD: Sub acromial Sub deltoid bursa; MSUS: Musculoskeletal Ultrasound

INTRODUCTION

Skeletal and joint disorders are the most common medical problem in patient undergoing on chronic haemodialysis (CHD) [1]. ESRD is commonly associated with CKD- Mineral and Bone Disorder (CKD-MBD) which is a systemic disease that includes skeletal abnormalities termed renal osteodystrophy, periarticular calcifications, tendon rupture, microcrystalline arthropathies, and infectious arthritis [2].

These disorders vary between male and female maintained on CHD. Ultrasonography (US) has been suggested as the modality of choice in evaluating these skeletal and joint disorders [3].

Assessment of musculoskeletal finding (articular and extraarticular tissues) by MSUS in both male and female maintained on regular haemodialysis with special attention for bone mineral assessment (serum calcium, phosphorus, PTH) anaemia and iron profile in the studied groups.

METHODOLOGY

Cross sectional observational study on all patients (50 patients) maintained on regular hemodialysis three times/ week for more than 6 months in Mansoura Nephrology and Dialysis Unit (MNDU) over a period of 6 months.

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Were subjected to

- Complete history and physical assessment focusing on musculoskeletal system (joint, tendon, bursa).
- Musculoskeletal ultrasound assessment using conventional grey-scale ultrasound machine with a 6-12 MHz linear transducer.
- All joints (hip, knee, ankle, shoulder, elbow, wrist and small joints of hand and feet) are going to be examined for erosion, osteophyte, effusion, synovial thickness, tendon for defect, echogenicity, muscles for tears and median nerve for entrapment.

Laboratory assessment

- Basic laboratory (CBC, liver function test, serum creatinine).
- Bone mineral assessment (serum calcium, phosphorus, PTH).
- Iron profile (Transferrin saturation (Tsat), Ferritin level).

RESULTS

Fifty patients of them 31 (62%) male, median of age 58 (36-63) years, and 19 (38%) female, median of age 42 (38-66) years, maintained on regular hemodialysis (three times/week) for median of duration in male 3 (1-6) years, Female 4 (2-8) years, According to finding in Table 1.

Male predominant

- Knee osteophytes with prepatellar effusion was the most common MSUS finding in 15/31 (48.4%) patients, but 8/31 (25.8%) patients had only knee osteophytes, 2/31 (6.5%) patients had Jumper's knee (Proximal patellar tendinopathy) and only one patient (3.2%) had knee effusion that successfully ultrasound guided drainage.
- Greater Trochanteric Pain Syndrome was chief complain in 2/31 (6.5%) patients, successfully ultrasound guided

corticosteroid injection, with long term improvement.

- Impingement syndrome with supraspinatus tendon abnormalities as Figure 1 and Biceps tendinopathy in 2/31 (6.5%) patients. Active tendinopathy and supraspinatus tendon was detected in one (3.2%) patient.
- Tendinopathy of the tibialis anterior tendon in 2/31 (6.5%) patients.
- Only one patient (3.2%) had Carpel tunnel syndrome that conservatively managed.

Female predominant

- Synovial hypertrophy in parapatellar recess was the most common MSUS finding 10/19 (52.6%) patients.
- Effusion was very common in knee and ankle joints 5/19 (26.3%) and 4/19 (21.1%) patients respectively. MSUS guided drainage of these effusion lead to marvelous response.
- Sub Acromial Sub Deltoid (SASD) bursa as Figure 2 and planter fasciitis were evident in 2/19 (10.5%) patients, successfully ultrasound guided corticosteroid injection.
- Tenosynovitis in supraspinatus and biceps tendon was evident in 1/19 (5.3%) patients.
- Planter fasciitis was evident in 2/19 (10.5%) patients, conservative management was advised According to finding in Table 2.

Regard bone mineral assessment

No statistically significant difference in Bone mineral disorder.

- Median of serum Ca 8.65 (8.05-8.98) mmol in male while in female 8.60 (7.50-8.80) mmol.
- Mean of serum PO4 5.78 ± 2.23 in male, 5.13± 1.49 mmol.
- Serum PTH was slightly higher in female, median 483.5

Table 1: Difference MSUS finding between female and male maintained on CHD.

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Type of disability		Male		Female			
			%	n	%	р	
	Tenosynovitis	1	3.2%	0	0.0%		
	Bursitis, biceps	0	0.0%	1	5.3%	2.254	
	tenosynovitis biceps and supraspinatus	2	6.5%	1	5.3%	0.276	
Shoulder	Bursitis, biceps+ tenosynovitisbiceps and supraspinatus	0	0.0%	1	5.3%		
Ankle	Effusion	0	0.0%	4	21.1%	0.022	
	Effusion	1	3.2%	5	26.3%	0.071	
	Osteophytes	8	25.8%	2	10.5%		
	Osteophyte with prepatellareffusion	15	48.4%	10	52.6%		
Knee	Knee effusion +enthesitis inpatellar tendon	0	0.0%	1	5.3%		
Hip	Bursitis	2	6.5%	0	0.0%	0.519	
	Carpel tunnel syndrome	1	3.2%	0	0.0%	0.47	
	Trochantric bursitis	2	6.5%	0	0.0%		
Softtissue	Enthesitis at patellar tendon	2	6.5%	1	5.3%		
Cortellosue	Supraspinatus tendinopathy	2	6.5%	0	0.0%		
	Injection and aspiration of kneeeffusion	2	6.5%	2	10.5%	0.744	
Intervention	Injection of trochnatric bursitis	2	6.5%	0	0.0%		
	Injection of supraspinatustendon	2	6.5%	0	0.0%		



Figure 1: 40 years old male patient presented with supraspinatus tendinopathy.



Figure 2: 38 years old female with SASD bursa in right shoulder.

(345.50-778.75) pg/l than in male 387.50 (202.50-914.75) pg/l.

• HB level was lower in female median 10.35 (9.50-12.33) g/l

and Transferrin saturation (Tsat) median 19.50 (16-35.75) while in male, median HB level was 11.15 (10.13-12.05) and median (Tsat) was 21 (17.50-32).

• Ferritin level 304.30 (191.30-573.20) ng/ml in female higher than in male 191 (93.28-467.63)ng/ml.

 Table 2: Difference between Bone mineral assessment between male and female maintained on CHD.

	Male		Female		P.	
Age		58.00 (36.00-		42.00	0.944	
Median(Q1-Q3)	31	63.00)	19	(38.00- 66.00)		
HD Duration Median(Q1-Q3)	31	3.00 (1.00-6.00)	19	4.00 (2.00- 8.00)	0.188	
Ca Median(Q1-Q3)	28	8.65 (8.05-8.98)	15	8.60 (7.50- 8.80)	0.313	
PO_4 Mean ± SD28		5.78 ± 2.23	15	5.13 ± 1.49	0.319	

DISCUSSION

Musculoskeletal Ultrasonography (MSUS) has been suggested as the modality of choice in assessment of skeletal disorder in chronic kidney disease maintained on CHD. CKD-mineral and bone disorder (CKD-MBD) is a systemic disease that includes skeletal abnormalities termed renal osteodystrophy, so assessment of bone mineral disease is important issue in the studied group. Gender may affect skeletal involvement in dialysis dependent patients.

In our study soft tissue predominantly affected female

Synovial hypertrophy in parapatellar recess was the most common MSUS finding 10/19 (52.6%) patients, also knee and ankle effusion was very common 5/19 (26.3%) and 4/19 (21.1%) patients respectively, the cause of underlying effusion is still incompletely explained haemodialysis patients as Ferrari et al. stated that Some highly inflammatory joint effusions in patients undergoing chronic haemodialysis are not due to pyogenic infections and may be attributable to other factors [4].

Sub Acromial Sub Deltoid (SASD) bursa in the shoulder and planter fasciitis were evident in 2/19 (10.5%) patients that successfully ultrasound guided corticosteroid injection, in agreement of study Draghi et al. stated that the effusion in the SASD bursa is frequently associated with shoulder pain often independently from the underlying pathology and concluded that bursitis is more frequent in women and represent highly disabling sharp acute pain, that scarcely responding to common pain killer [5].

Tenosynovitis in supraspinatus and biceps tendon was evident in 1/19 (5.3%) patients the definite cause is unclear; may be related to traumatic event or metabolic abnormality associated with dialysis.

While in male, mechanical pain predominate in most of them

Knee osteophytes with prepatellar effusion was the most common MSUS finding in 15/31 (48.4%) patients, but 8/31 (25.8%) patients had only osteophytes.

Jumper's knee (Proximal patellar tendinopathy) has been detected in 2/31 (6.5%) patients, followed by Greater Trochanteric Pain Syndrome in 2/31 (6.5%) patients that successfully ultrasound

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guided corticosteroid injection.

Due to prevalence of knee and hip joints and its mechanical nature of pain raise that is highly associated to metabolic related to dialysis as secondary hyperparathyroidism which is frequent in our studied group, this in agreement with El-Kishawi, et al. stated that in, secondary hyperparathyroidism, bone remodelling and mineralization are affected and Pelvic bones, hip joints, and bones of lower extremities can be deformed, and increased stress from weight-bearing can lead to fractures [6].

Shoulder involvement is very common among our patients; impingement syndrome with supraspinatus tendon abnormalities and Biceps tendinopathy in 2/31 (6.5%) patients, may be related to amyloid deposition, T Konishiike et al. concluded that one type of shoulder pain in patients on long-term haemodialysis is caused by the subacromial impingement of amyloid deposits [7].

Regard bone mineral assessment in both genders

Not statistically significant in serum calcium and phosphorus level, but serum PTH was higher in female 483.5(345.50-778.75) pg/l, with lower level in male 387.50 (202.50-914.75) pg/l. This value are accepted in CKD maintained on CHD may due to efficient dialysis and good control of secondary hyperparathyroidism in studied patients, that in agreement with Zhan et al. Extended hours haemodialysis independently reduced serum phosphate levels with minimal change in serum calcium and PTH levels [8].

Hemoglobin level (HB) was lower in female median 10.35 (9.50-12.33) g/l and Transferrin saturation (Tsat) median 19.50 (16-35.75) than male 11.15 (10.13-12.05), 21 (17.50-32) respectively, but to some extant with normal range because most of studied patients maintained on regular haemodialysis (Three time weekly) Lankhorst CE et al. that suggests dialysis therapy may modulate and affect key processes of anaemia and its therapy.

Ferritin level 304.30 (191.30-573.20) ng/ml in female higher than in male 191 (93.28-467.63) ng/ml, may due associated with inflammation occur in patients maintained on CHD [9,10].

CONCLUSION

Soft tissue affection (SASD bursa, planter fasciitis and prepatellar effusion) more MSUS manifestation in female that need through assessment and management. Knee osteophytes with prepatellar effusion, Jumper's knee are common in male; that are highly related with dialysis duration and secondary hyperparathyroidism, so proper assessment and correction of the serum calcium and phosphorus levels within the normal range along with control of PTH and vitamin D levels is the key in management secondary hyperparathyroidism.

CKD-Mineral and Bone Disorder (CKD-MBD) are commonly seen in Chronic Kidney Disease (CKD) maintained on regular haemodialysis with no significant association to gender whether male or female, that can be controlled with efficient dialysis, medical and surgical correction of secondary hyperparathyroidism.

ONE OF LIMITATION IN THIS STUDY

Small sample size, assessment of Beta 2 Microglobulin (b2M) and serum amyloid level and its correlation to joint manifestation.

DECLARATION OF CONFLICT OF INTEREST

No declaration of conflict of interest.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethics approval and consent to participate was taken by IRB Mansoura.

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