Hemo dialysis access complications during the first 30 days in Libyan patients: a single center experience

Habas Elmukhtar *
EmsadSalha **
Kanonie Wadie ***

Abstract:

Temporary hem dialysis (HD) catheter is required mostly in acute and chronic renal failureandother cases. HD catheter is not free of complications. Thus, the aim of this study is to assess the common complications occur during HD-catheter insertion and during the first 30-days of insertion. Methods: two hundred-ten patients had temporary HD catheter been inserted in Central Hospital (Tripoli) and in near other private clinics. Patients had questionnaire that prepared about the complications. They were divided into three groups according to the site of HD catheter insertion at presentation. The complications detected by patients and/or following up doctors reported in the same questionnaire. Data was collected at the end of 30 days after HD-catheter insertion and analyzed for demographic patients feature, and the complications reported at insertion and during the first 30 days. Results: Randomly allocated patients as they were presented. Group A: 95 patients had catheter at the jugular veins. Group B: 73 patients had femoral vein canalization and group C: 42 patients had subclavian vein catheterization. Pain at the site of insertion and during the first 12 hours was common complications (72.9%) and pain around the insertion site reported by 48.6% patients.

* Medical Department, Faculty of Medicine, University of Tripoli.
** Medical Department , Nephrology Unit.
*** Medical Department Medical Intensive Care Unit.

Infection at the site of insertion reported in 38.6% of patients. Femoral vein catheterization entrance site infection was reported in 55.6%, at subclavian in 18.5% and at jugular veins in25.9% patients. Catheter tunnel infection was reported in 5.2% patients. Catheter tunnel infection was more with femoral catheter. Arterial or venous HD catheter lumen blockage reported in 21.9%. Two lumens blockage reported in 61 29% patients. Bleeding from the entrance site of the catheter reported during HD sessions reported in 4.8% patients. Hematoma at insertion site or around it was reported in 24.8% patients. It was more after femoral vein catheterization (53.8%) followed by jugular (34.6%) then subclavian catheterization (11.5%) patients. In conclusion, pain and infection at the insertion site were the commonest complications of HD catheter insertion. Reducing rate of these complications depends mainly upon implanting strict septic techniques,and train doctors and nurses about HD insertion complications and care.

Keywords: Hemo dialysis catheter, double lumen catheter blockage, catheter infection, septicemia, Libya.

Introduction:

Hemodialysis (HD) becomes a standard therapeutic modality, safe and well accepted by end-stage renal disease (ESRD) patients, although HD- dependent patients' life expectancy is shorter than the normal population (1). There are various modalities of blood toxins removal as HD, continues renal replacement therapy (CRRT) and peritoneal dialysis. All these modalities need access that should be ideally arterial line and venous line. Unfortunately, arterial puncturing is painful and may lead to severe complicationscompared to venous catheterization. This does not mean venous HD catheterization is free of complications (2).Jugular, subclavian and femoral veins are the most commonly used sites for HD catheter insertion (3). Insertion of HD access into femoral vein is safer, and has less complications

compared to subclavian and jugular vein canalization during insertion. Previously, insertion of catheter into femoral vein was more associated with infection, but, recently due to strict infection control and strict septic insertion techniques, femoral HD catheter can stay in place longer with less risk of complication (4).

It is reported that about 16-25% of HD patients admitted in hospital due to HD vascular access complications as HD catheter lumens blockage either arterial or venous side by thrombus. Infection at insertion site to HD-catheter tip causing bacteremia or/and septicemia(5-10). Various studies were done to assess the complications of HD-catheter worldwide, up to our knowledge, there was not any study carried in Libya to assess the main complications of HD catheter insertion, and the common causes of HD catheter malfunctioning. Therefore, this study was conducted to study these two issues concerning the temporary HD-catheter. Therefore, the present study was aimed to study the frequency of temporary HD catheter insertion complications at insertion time and during the first 30 days.

Materials and Methods:

Two hundred and ten HD patients included in this study. They had been HD inserted in Medical Department at Central Hospital(Tripoli) and private clinics atintensive care units from January, 2017 toJanuary, 2018.Verbal consent was obtained from each patient before collecting data. The sites of HD catheter insertion were at internal jugular, femoral and subclavian veins. Patients included were divided randomly as they presented and according to the suitable site of HD insertion into three groups. Group-A patients had HD catheter inserted into jugular veins. Group-B patient had HD catheter inserted into subclavian veins, and group-C had HD catheter inserted into femoral veins.The patients had their first HD session at the Central Hospital, HD unit. Those patients who had complicationsand

dialyzed at other HD centers were sent back to Central Hospital for catheter inspection, change or removaland new catheter insertion at another site.

Patients'complaints as fever, pain at insertion and/or after insertion, blockage of either one lumen or two lumens, pus discharge, and significant amount of blood loss during insertion or after insertion, and during HD from the catheter insertion point and other complaints, or notes from follow up doctors were recorded in a form given to the patients. Patients had obvious evidence of infection, severe bleeding from catheter insertion site or other sites were usually admitted in the hospital and managed accordingly.

Statisticalanalysis: thedatawereprocessed in Excel Microsoft program and Statistical analysis usingdescriptive methods was done by using IBM-SPSS statistical package version 18 program (SPSS inc., Chicago III, USA).

Results:

According to the site of insertion, the patients were divided into three groups. Group A that included95 patients who had catheter inserted at the jugular veins (either right or left). Group B included 73 patients who had femoral vein canalization and group C included 42 patients, and they had subclavian vein catheterization. Group A had 65 male and 30 females patient, group B consisted of 42 male and 31 females and Group C had 30 male patients and 12 female patients (Table 1). The patients mean age was 55.1 ± 5.12years and ranged between 22 – 68 years of age.

Table 1: Distribution of HD inserted according to site and sex

Site	Jugular (%)	Femoral (%)	Subclavian(%)	Total
Male	68.4%	57.5%	21.9%	137
Female	31.6%	42.5%	16.4%	73
Total	45.2%	34.8%	20%	210

Patients complained of significant pain at the time of insertion at insertion site were 153 (72.9%). They were 91male patients, 62 female patients. Pain around the insertion site during the first 12 hours was reported by 102 (48 males and 54 females) patients. Poor blood flow was noticed in 98 (47 males and 51females) patients. Internal carotid, femoral and subclavian artery puncturing was reported in 67 (31.9%) of patients who were 28 (41.8%) male and 39 (59.2%) were female patients. Infection at the site of insertion reported in 81 (38.6%) of patients who were 28 (34.6%) male and 53 (65.4%) female patients.

Femoral vein catheterization entrance site infection was reported 45 (55.6%), the subclavian infection reported in 15 (18.5%) and in jugular veins catheterization, 21 (25.9%) patients. Catheter tunnel infection was reported in 11 (5.2%) of patients; 3 (27.3%) were male and 8 (72.7%) were female patients. Catheter tunnel infection was reported more with femoral catheter insertion 6 (54.5%), jugular 3 (27.3%) and subclavian 2 (18.2%). Bacteremia reported in 23 (11%) patients; 9 (39.1%) male and 14 (60.9%) female patients. Bacteremia reported in femoral catheterization in 15 (65.2%). Bleeding from the entrance site of the catheter noticed during HD sessions reported in 10 (4.8%) of patients. They were 2 (20%) male and 8 (80%) female patients.Arterial or venous lumen blockage reported in 46 (21.9%) patients; 15 (32.6%) were male and 31 (67.4%) female patients. Two lumens blockage reported in 61 (29%) patients; 27 (44.3%) male and 34 (55.7%) female patients. Hematoma at insertion site or around the site was reported in 52 (24.8%) patients. They were 21 (40.4%) male and 31 (59.6%) female patients. Hematoma was reported more after femoral vein catheterization 28 (53.8%), followed by jugular 18 (34.6%),and subclavian catheterization 6 (11.5%) patients.

Pneumothorax was noticed in 38 (18.1%) patients. They were 14 (36.8%) male and 24 (63.2%) female patients. Pneumothorax was

more reported with jugular 33 (86.8%) especially on right side 17 (44.7%)thansubclavian 5 (13.2%) patients. Subcutaneous emphysema reported in 6 (2.9%) patients. They were 2 (33.3%) male patients and 4 (66.7%) female patients. Subcutaneous emphysema is more common with female patients and more common with right jugular vein canalization. Bleeding from the entrance site during HD was more with femoral 6 (60%), jugular 3 (30%) patients, and subclavian vein 10% patients.

Table 2: Complications frequency and percentage

Complications	Patients (n)	Males	Females
Pain at insertion	153/ (72.9%)	59.5%	40.5%
Pain during 12hrs	102/ (48.6%)	47.1%	52.9%
Poor blood flow	98/ (46.7%)	48.0%	52.0%
Infection at site of insertion	81/ (38.6%)	34.6%	65.4%
Artery puncturing	67/ (31.9%)	41.8%	59.2%
Two lumens blockage	61/ (29.0%)	44.3%	55.7%
Hematoma	52/ (24.8%)	40.4%	59.6%
One lumen blockage	46/ (21.9%)	32.6%	67.4%
Pneumothorax	38/ (18.1%)	36.8%	63.2%
Tunnel infection	11/ (5.2%)	27.3%	72.7%
Subcutaneous emphysema	6/ (2.9%)	33.3%	66.7%
Bacteremia	23 (11.0%)	39.1%	60.9%
Bleeding from insertion site during HD	10/ (4.8%)	20.0%	80.0%

Discussion:

Chronic kidney disease (CKD) and ESRD are common death leading diseases in the world, and they become a burden upon the health service providers and the community authorities. CKD and ESRD care require considerable care and have many short and long-term complications that need huge economical expenses. The increase in the rate of CKD and ESRD worldwide, and in Libya makes the more demands for hemodialysis. The main contributory causes of ESRD in the world as well in Libya are diabetes mellitus,

hypertension and obesity(11-14).During the last 10 years of last century and in this century, health care service was good, and life expectancy in the Libyan community was better than before. This has led to relative increase in the number of old-age population in the Libyan community. The increase in elderly population led to anincrease inprevalence of CKD and ESRD. The increase of ESRD rate is not well accommodated by Libyan health survives providers and the social local authorities especially during the last 8 years (15).HD is the main renal replacement modality for the ESRD-patients in Libya. Other modalities as peritoneal and renal transplant are not widely available due to many difficulties(16-19). The relative less availability of these modalities, anddue to wide availability and costless service of HD throughout the country had made HD themain treatment option for ESRD patients(20).

In USA, HD via HD-catheter increased to about 25% of HD patients, however, the usage of double-tunneled HD catheter as it advised by the National Kidney Foundation must not exceed 10%. Theincreased rate of HD-catheter usage has led to an increase in mortality and morbidity rate to approximately 2- 3 times, and serious infection 5-10 times compared to HD througharterio-venous fistulas. This rise in the rate of complications following HD via double-lumen catheter made the National Kidney Foundationto issue statement that stated the rate HD-catheter insertion must not exceed 10%(21-23).Veno-arterial or more commonly dual venous access is needed to draw the blood out and to return the blood back to circulation after hemodialysis-filtration process by special equipment. Inserting hemodialysis access has many complications. Therefore, this study designed to assess the main complications during insertion, and during the first 30 days.

In this study, the most common complaint by patients was pain during insertion. This might be due to inadequate local anesthesia

infiltration at the site of insertion or/and the operators did not give enough time for the local anesthetic agent to do its full action. The second common complaint by patients was pain at the puncturing site during the first 12 hours. This complaint is mostly due to multiple puncture trials, and most of the studied patients had this complaint had not prescribed analgesic drugs by operated doctors after catheter insertion. Furthermore, the routine practice of HD-catheter insertion in most of local hospitals is blind by new trainee doctors, and Doppler ultrasound guided HD insertion is not a common practice.This mal-practice had also led to multiple trials and multiple puncturing sites.

This practice might be ledalso to a higher rate of arterial puncturing and hematoma at the site of HD catheter entrance in this study.All these factors might had attributed to an increase the number of patients complained of pain at the entrance site during insertion and during the first 12 hours. HD catheter induced infection is not uncommon problem in most of HD centers worldwide (24-27). In this study, infection report in 92 patients, and it wasmore at the site of puncturing than the catheter tunnel. This increased number of infection was mostly due to inappropriate septic procedure by the operators or/and due to contamination from the surrounding environment at a time of insertion. Furthermore, inappropriate catheter manipulation and care at HD session andduring insertion by the operators and nurses might increase the risk of infection. Lumen blockage is a known complication of HD catheter in regular HD-patients(28). Single or double lumen blockage of HD-catheter reported in the study with almost the same percentage in other previous studies. Others complication as pneumothorax and subcutaneous emphysema and bleeding from the insertion site were not uncommon, however, they were not different significantly from the previously reported results(26-28).

Conclusion:

Although HD catheter is needed to conduct HD as a life-saving procedure in acute situations, it is not free of complications. Strict septic conditions, well-traineddoctors, HD technicians and nurses are needed to minimize the complication of temporary HD catheter during the first 30 days.

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