

# Common Complications Associated with the Femoral Sheath Removal After Cardiac Catheterization According to Type of Technique: Comparative Study

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## ABSTRACT

**Background:** Cardiovascular diseases (CVDs) are the leading cause of death in almost every region of the world. According to the World Health Organization 2015 statistics, CVDs account for 17.7 million or 31% of all deaths worldwide. An estimated 7.4 million of these deaths are due to coronary heart disease (CHD). Coronary artery disease (CAD) is responsible for myocardial ischemia, including angina pectoris, myocardial infarction, and ischemic heart failure and is the leading cause of morbidity and mortality in the world. Although the rates of coronary revascularization procedures it has continued to treat and reduce the problems caused by coronary artery disease globally.

**Aim:** Aimed to determine the early common problems associated with the femoral sheath removal after cardiac catheterization.

**Method:** A descriptive study design was carried out in Kerbala Cardiac Surgery Center in Imam Al-Hussein Medical City, from the period of 11th November 2021 to 25th April 2022. A nonprobability sampling method (convenience) consisting of 120 patients was included in this study. The data were analyzed using the IBM Statistical Package of Social Sciences (SPSS) Version 25.

**Results:** The study show that a statistically significant relationship between vascular complications and BMI, medication chronic diseases, heparin dose, size of femoral sheath, blood pressure, packed cell volume (P.C.V), and platelets count in therapeutic and diagnostic groups.

**Conclusion:** These study findings reported that about half of patients were elderly, majority of them were males and smokers, and about half of them had obesity of class I. The study concluded that there is a discrepancy in the chances of problems occurring after the femoral sheath removal after cardiac catheterization. So that this disparity was clear in the severity of the problems (Urinary retention, back pain, Bleeding, Hematoma, Ecchymosis, and Local pain) in patients who underwent therapeutic catheterization more than diagnostic catheterization.

**Recommendations:** suggest taking into account age, chronic diseases, obesity, and the size of the femoral sheath before deciding to perform a therapeutic catheter. It is preferable to maintain blood pressure within the normal level before performing cardiac catheterization. Further experimental studies must be conducted to find an interventional protocol that prevents or reduces the occurrence of these problems.

**Keywords:** Common Problems, Femoral Sheath, Cardiac Catheterization

## INTRODUCTION

In practically every part of the world, cardiovascular diseases (CVDs) constitute the main cause of mortality. According to World Health Organization estimates from 2015, CVDs account for 17.7 million deaths globally, or 31% of all deaths. Coronary heart disease is responsible for an estimated 7.4 million of these deaths<sup>1</sup>. Coronary heart disease, often known as coronary artery disease, is the leading cause of mortality worldwide. According to the American Heart Association, the number of people diagnosed with CHD will nearly double by 2030. CHD is the second biggest cause of mortality globally, according to<sup>2</sup>. Coronary artery disease (CAD) is one of the most common cardiovascular disorders that affect people all over the world. In both developed and emerging nations, this disease has been proven to be the leading cause of mortality<sup>3</sup>. Patients with a totally occluding thrombus

in a coronary artery (STEMI) require immediate therapy to open the blocked artery. This can be done with medicines or with percutaneous coronary intervention (PCI) in a cardiac catheterization lab<sup>4</sup>. According to certain studies such as<sup>5</sup>, the patient stays immobile for 4 to 6 hours after the femoral sheath is removed after a cardiac catheterization operation. After cardiac catheterization, cold compresses help to prevent vascular problems. In addition, the study<sup>6,7</sup> found that applying direct pressure to the ruptured artery after removing the femoral sheath following cardiac catheterization reduces vascular problems.

## METHODOLOGY

A descriptive study design was carried out in Kerbala Cardiac Surgery Center in Imam Al-Hussein Medical City in Holy Karbala, Iraq; the study was initiated from the period of 11th November 2021 to 25th

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April 2022 to determine the early common problems associated with the femoral sheath removal after cardiac catheterization according both type catheterization (diagnostic and therapeutic) of and to find out the relationship between the early common complications and patients' socio-demographic characteristics and clinical data A nonprobability sampling method (convenience) consisting of 120 patients was included in this study who agreed to participate in this study. A questionnaire form was prepared by the researchers to collect all the relevant data associated with the study sample, it is involving three main parts: are including participants' socio-demographic, clinical data, and A questionnaire related to collected data about early common complications that associated with the femoral sheath removal after cardiac catheterization such as urinary retention, back pain, local bleeding, hematoma, ecchymosis, and local pain. The following problems (urinary retention, back pain, local bleeding, hematoma, and local pain) were measured immediately after the femoral sheath was removed. As for the ecchymosis, it was measured 24 hours after the femoral sheath removal. The data were collected directly from patients by the researchers through the interviewing technique. Finally, the data were analyzed by using the program of IBM Statistical Package of Social Sciences (SPSS) Version 26, both descriptive statistical analysis procedures (frequency, percentage) and inferential statistical analysis (chi-square) were used to analyze and assess the results of the study, a p-value <0.05 was considered statistically significant.

**RESULTS**

**Table 1:** Distribution of participants according to their socio-demographic characteristics

Socio-demographic Characteristics		Type of catheterization			
		Diagnostic		Therapeutic	
		f.	%	f.	%
Age	40 - 49	2	3.3	7	11.7
	50 - 59	27	45	29	48.3
	60 – 69	28	46.7	17	28.3
	≥ 70	3	5	7	11.7
	Total	60	100	60	100
Gender	Male	54	90	46	76.7
	Female	6	10	14	23.3
	Total	60	100	60	100
Smoking	Yes	42	70	47	78.3
	No	18	30	13	21.7
	Total	60	100	60	100
Body Mass Index	Normal weight	5	8.3	21	35
	Overweight	21	35	10	16.7
	Obesity class I	31	51.7	23	38.3
	Obesity class II	3	5.0	6	10.0
	Total	60	100	60	100

Table (1) indicates that approximately half of the patients participating in the diagnostic and therapeutic groups were within the age groups of (50 – 59) years old and accounted for 45% for the diagnostic group, and 48.3% for the therapeutic group. 90% of the diagnostic group and 76.7% of the therapeutic group were males. While the greater percentage 70% and 78.3% of the patients who participated in the diagnostic and therapeutic groups respectively smoking. 51.7% of the patient participant in diagnostic group were classified as obesity class I and 38.3% for the therapeutic groups.

**Table 2:** Distribution of participants according to their clinical data

Clinical data		Type of catheterization			
		Diagnostic		Therapeutic	
		f.	%	f.	%
Chronic diseases	HT	34	56.7	23	38.3
	DM	6	10	4	6.7
	HT and DM	20	33.3	33	55
	Total	60	100	60	100
Medication Chronic Diseases	Aspirin Tab	18	30	26	43.3
	Plavix Tab	31	51.7	11	18.3
	Aspirin And Plavix	11	18.3	23	38.3
	Total	60	100	60	100
Heparin Dose	Non	24	40	13	21.7
	6000 IU - < 8000 IU	22	36.7	6	10
	8000 IU - <10000 IU	8	13.3	33	55
	≥10000 IU	6	10	8	13.3
	Total	60	100	60	100
Size of sheath	6 Fr	42	70	53	88.3
	7 Fr	18	30	17	11.7
	Total	60	100	60	100
Systolic blood pressure (mm hg)	< 120	7	11.7	2	3.3
	120- 129	9	15	2	3.3
	130 - 139	14	23.3	20	33.3
	140 - 149	21	35	26	43.3
	≥ 150	9	15	10	16.7
	Total	60	100	60	100
	< 80	17	28.3	6	10
Diastolic blood pressure (mm hg)	80 - 89	34	56.7	26	43.3
	90 - 99	8	13.3	27	45
	≥ 100	1	1.7	1	1.7
	Total	60	100	60	100
P.C.V	30 – 39%	34	56.7	40	66.7
	40 – 49%	21	35	15	25
	≥ 50%	5	8.3	5	8.3
	Total	60	100	60	100
Platelet (mcL)	< 150000	13	21.7	6	10
	150000 - 450000	43	71.7	48	80
	> 450000	4	6.7	6	10
	Total	60	100	60	100

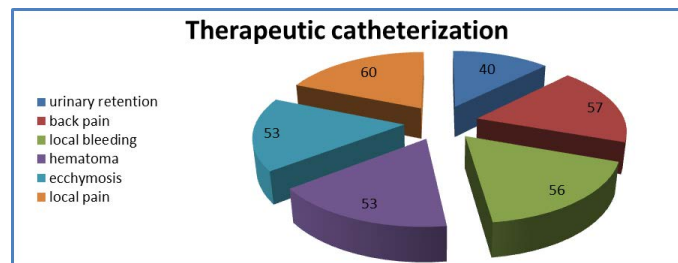
Table (2) showed that the therapeutic and diagnostic groups had chronic diseases. The diagnostic group had, nearly half 56.7% had hypertension and 38.3% for the therapeutic group. Regarding the use of medication chronic diseases, the two groups were treated with anticoagulant drugs, 51.7% of the diagnostic group and 18.3% of the therapeutic group were treated with Plavix. As for heparin that was used during cardiac catheterization, it was used by 40% in the diagnostic group and in the therapeutic group 21.7%. The size of (6fr) the femoral sheath was in the diagnostic group 70% and the therapeutic group 88.3 %. The systolic blood pressure (140 - 149 mm hg), the 35% in the diagnostic group and 43.3% in the therapeutic group. With regard to diastolic blood pressure in the therapeutic group 43.3% and the diagnostic group 56.7%. Regarding laboratory tests, the (P.C.V) packed cell volume was 66.7% for the therapeutic group and 56.7% for the diagnostic group. As for the platelets count within the normal range for the two groups, 80 % for the therapeutic study and 71.7% for the diagnostic study.

**Table 3:** Distribution of common complications according to their type of catheterization

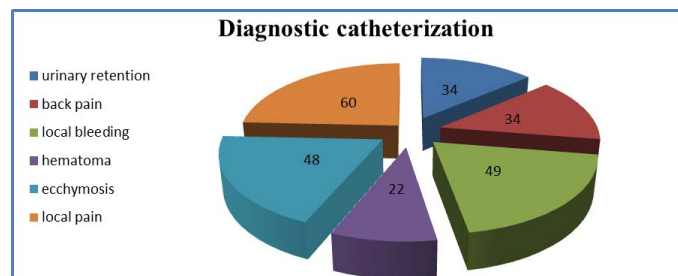
Complications		Type of catheterization			
		Diagnostic		Therapeutic	
		f.	%	f.	%
Urinary retention	Yes	34	56.6	40	66.6
	No	26	43.4	20	33.4
	Total	60	100	60	100
back pain	Yes	34	56.6	57	95
	No	26	43.4	3	5
	Total	60	100	60	100
Bleeding	No bleeding	11	18.3	4	6.7
	Mild	22	36.7	17	28.3
	Moderate	20	33.4	32	53.3
	Sever	7	11.6	7	11.7
	Life Threatening	0	0	0	0
	Total	60	100	60	100
Hematoma	No Hematoma	38	63.3	7	11.7
	Small	21	35	28	46.7
	Medium	1	1.7	21	35
	Large	0	0	4	6.7
	Total	60	100	60	100
Ecchymosis	No Ecchymosis	12	20	7	11.6
	Small	26	43.4	7	11.6
	Medium	17	28.3	12	20
	Large	5	8.3	34	56.8
	Total	60	100	60	100
Local pain	No Pain	0	0	0	0
	Mild	18	30	20	33.3
	Moderate	30	50	21	35
	Sever	12	20	19	31.7
	Total	60	100	60	100

Table (3) showed that the differences in the urinary retention, back pain bleeding, hematoma, ecchymosis, and local pain between the diagnostic and therapeutic group. In the diagnostic group the urinary retention was the 56.6 % and 66.6 % in the therapeutic group. Regarding the results find out 56.6 % of patients had back pain in therapeutic group and 95 % diagnostic group. In the diagnostic group was the 81.7 % of

patients had bleeding while 93.3% of therapeutic group as. Regarding the hematoma size the 88.4% of patients had hematoma in therapeutic group and 63.3% diagnostic group. Regarding the ecchymosis size was 13.3% of patients in therapeutic group had ecchymosis while 80% in diagnostic groups. Finally, 100% in the therapeutic group and diagnostic group have local pain.



**Figure 1:** The number of times the complications of the femoral sheath removal occur in the diagnostic catheterization



**Figure 2:** The number of times the complications of the femoral sheath removal occur in the therapeutic catheterization

## DISCUSSION

Table (4) and table (5) show a statistically significant relationship between the patient with diagnostic catheterization and socio-demographic characteristics: The results of this study identified the relationship between the bleeding with smoking Thabet et al.<sup>9</sup> refer that the patient in the study as a risk for bleeding because were smoker that was the effect on coagulation factors. Although for this reason will increase the risk of ecchymosis in smoker patients and this result was the same found in a study conducted by (Grant et al.<sup>10</sup>). There is a

**Table 4:** Association between common complications with patient' socio-demographic characteristics & clinical data under diagnostic catheterization

Socio-demographic Characteristics & Clinical data	Complications											
	Urinary retention		back pain		Bleeding		Hematoma		Ecchymosis		Local pain	
	p-value	sig.	p-value	sig.	p-value	sig.	p-value	sig.	p-value	sig.	p-value	sig.
Age	0.121	NS	0.337	NS	0.440	NS	0.850	NS	0.333	NS	0.897	NS
Gender	0.962	NS	0.322	NS	0.210	NS	0.333	NS	0.880	NS	0.742	NS
Smoking	0.224	NS	0.350	NS	0.001	S	0.022	NS	0.501	S	0.290	NS
Body Mass Index	0.050	NS	0.045	NS	0.007	S	0.031	S	0.007	S	0.045	NS
Chronic diseases	0.702	NS	0.038	NS	0.042	S	0.050	S	0.342	S	0.008	NS
Medication Chronic Diseases	0.784	NS	0.232	NS	0.234	NS	0.112	NS	0.234	NS	0.666	NS
Heparin Dose	0.652	NS	0.908	NS	0.001	S	0.044	S	0.020	S	0.941	NS
Size of sheath	0.133	NS	0.155	NS	0.002	S	0.000	S	0.044	S	0.651	NS
Systolic blood pressure	0.001	NS	0.209	NS	0.002	S	0.001	S	0.050	S	0.419	NS
Diastolic blood pressure	0.001	S	0.491	NS	0.004	S	0.002	S	0.044	S	0.691	NS
P.C.V	0.206	NS	0.343	NS	0.546	S	0.667	S	0.546	S	0.343	NS
Platelet	0.150	NS	0.432	NS	0.166	S	0.486	S	0.166	S	0.432	NS

**Table 5:** Association between common complications with patient' socio-demographic characteristics & clinical data under therapeutic catheterization

Socio-demographic Characteristics & Clinical data	Complications											
	Urinary retention		back pain		Bleeding		Hematoma		Ecchymosis		Local pain	
	P-value	sig.	P-value	sig.	P-value	sig.	P-value	sig.	P-value	sig.	P-value	sig.
Age	0.821	NS	0.737	NS	0.044	S	0.250	NS	0.4563	NS	0.897	NS
Gender	0.562	NS	0.222	NS	0.210	NS	0.133	NS	0.312	NS	0.742	NS
Smoking	0.774	NS	0.550	NS	0.050	S	0.010	S	0.467	NS	0.290	NS
Body Mass Index	0.010	NS	0.040	NS	0.000	S	0.021	S	0.000	S	0.045	NS
Chronic diseases	0.049	NS	0.003	NS	0.049	S	0.022	S	0.366	NS	0.008	NS
Medication Chronic Diseases	0.994	NS	0.232	NS	0.994	NS	0.912	NS	0.291	NS	0.666	NS
Heparin Dose	0.332	NS	0.108	NS	0.000	S	0.050	S	0.044	S	0.941	NS
Size of sheath	0.983	NS	0.955	NS	0.000	S	0.000	S	0.031	S	0.651	NS
Systolic blood pressure	0.301	NS	0.509	NS	0.000	S	0.008	S	0.031	S	0.419	NS
Diastolic blood pressure	0.822	NS	0.891	NS	0.004	S	0.007	S	0.013	S	0.691	NS
P.C.V	0.606	NS	0.143	NS	0.940	S	0.867	NS	0.546	NS	0.343	NS
Platelet	0.950	NS	0.232	NS	0.860	S	0.546	NS	0.166	NS	0.432	NS

significant relationship between bleeding, hematoma, ecchymosis with BMI a patient with a high body weight was a risk for hypertension and the will lead to an increased risk of bleeding, hematoma, ecchymosis this was supported by Schumann et al.<sup>11</sup> also was founded the obesity patient was more risk for bleeding. Chronic disease special hypertension and this result was the same found in a study done by Kutkut et al.<sup>12</sup> also found that patients with hypertension are more at risk for bleeding, hematoma, and ecchymosis when was under cardiac catheterization. Heparin dose had significant relationship with bleeding, hematoma, and ecchymosis that was attributable to heparin work as increased coagulation time a study conducting by Besli et al.,<sup>13</sup> that was refer to patient was under cardiac catheterization was more risk for vascular complication with increase dose of heparin Size sheath had significant relationship with vascular complication, increase the size of the femoral sheath causes increase the incidence of vascular complications that agree with the study was conducted by Batchelor et al.,<sup>8</sup> explain that the vascular complication with Size sheath for the patient under cardiac catheterization. Systolic pressure had significant relationship with vascular complication because high systolic blood pressure is increasing blood flow in vascular system, and this finding come along with a study done by Aguiar et al,<sup>14</sup> was reported that the patient under cardiac catheterization and high systolic pressure they will become more risk of vascular complication. Regarding the P.C.V, platelet count for the participant were both have a relationship with bleeding, hematoma, and ecchymosis because the low (P.C.V) and platelet count will effect on coagulation time, the study was conducted by Boulos et al.<sup>15</sup> explain that the vascular complication for the patient under cardiac catheterization with thrombocytopenia and low hematocrit.

### CONCLUSION

These study findings reported that about half of patients were elderly, majority of them were males and smokers, and about half of them had obesity of class I. one third of patients under diagnostic catheterization and half of therapeutic catheterization were suffering from hypertension and DM and most of them were taken aspirin and Plavix as medication for chronic diseases. In diagnostic catheterization about half of the patients were taken 6000 IU - <8000 IU of heparin but were more than half patents under therapeutic catheterization were taken 8000 IU-10000 IU of heparin. Size of sheath (6fr) was used for most of patients. Most of them suffered from elevated of systolic and diastolic blood pressure.

P.C.V for more than of them was (30-39%). And the platelet count for most of patients was 150000-450000 mcl. The study concluded that there is a discrepancy in the chances of problems occurring after the femoral sheath removal after cardiac catheterization. So that this disparity was clear in the severity of the problems (Urinary retention, back pain, Bleeding, Hematoma, Ecchymosis, and Local pain) in patients who underwent therapeutic catheterization more than diagnostic catheterization. There is a statistically significant association between the problems that accompiend the femoral sheath removal procedure with Body Mass Index, Chronic diseases, Heparin Dose, Size of sheath, Systolic blood pressure, and Diastolic blood pressure.

### RECOMMENDATIONS

Suggest taking into account age, chronic diseases, obesity, and the size of the femoral sheath before deciding to perform a therapeutic catheter.

It is preferable to maintain blood pressure within the normal level before performing cardiac catheterization.

Further experimental studies must be conducted to find an interventional protocol that prevents or reduces the occurrence of these problems.

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**Potential Conflict of Interest:** None

**Competing Interest:** None

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