Journal of Kerbala University , Vol. 14 No.2 Scientific . 2016

Isolate and Identification some of the pathogens of cardiac catheterization patients in the city of Karbala

عزل وتشخيص بعض المسببات المرضية من مرضى قسطرة القلبية في محافظة كربلاء

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Abstract:

A total of 89 samples have being collected from cardiac catheterization unit patients who admitted to the Imam Hussein Teaching Hospital in Karbala for seven months, starting from (January 2014 and to the end of July 2014) from both sex and aged between (29-75) years. and due to the absence of a local study on pathogens isolated from cardiac catheterization patients came this study.

The samples were melded : swabs , catheter tip and the blood culture before and after cardiac catheterization, cardiac catheterization was classified in to three categories catheterization diagnostic , therapeutic catheterization and both of them. diagnostic catheterization samples was 66(74.16%) and gave positive results for bacterial culture (number patients of them) swabs test 15(22.73%),while the catheter tip test 14(21.21%), blood culture 14(21.21%) before a catheterization and 15(22.73%) after a catheterization . Either therapeutic catheterization samples15(16.85%) of them were infected with 6(40%) for all tests. The diagnostic and therapeutic catheterization together samples 8(8.99%) the patients were of them 4(50%) ,4(50%) ,4(50%) and 3(37.5%) respectively.

The results showed an sensitivity value of 96% and specificity 100% for swabs testing and catheter tip, either sensitivity values and the specificity 100% and 98.5% to the blood culture test respectively.

it is became clear from our results that out of 89 sample collected there wa 25(28.09%) positive culture and two samples of them showed two types of pathogen it is noting that exact number have 27 bacteria isolated as 11(70.74%) gram positive , 15(55.56%) gram negative and 1(3.70%) yeasts, while 64(71.91%) not gave any growth .

Key words : Etiologic factor, Cardiac Catheterization

الخلاصة:

جمعت تسعة وثمانون عينة من مرضى وحدة القسطرة القلبية الذين يراجعون مستشفى الامام الحسين (ع) التعليمي في محافظة كربلاء المقدسة لمدة سبعة اشهر، ابتداءً(من كانون الثاني 2014 وانتهاءً بتموز 2014) من كلا الجنسين وبعمر يتراوح من (29-75) سنة، ونظرا لعدم وجود دراسة محلية على المسببات المرضية المعزولة من مرضى القسطرة القلبية جاءت هذه الدراسة

شملت العينات مسحات من عدة القسطرة القلبية ، زرع طرف القسطار وزرع عينة الدم قبل وبعد اجراء القسطرة ولكل فئة من فئات القسطرة وهي القسطرة التشخيصية والعلاجية وكلا النوعين معا.

كانت عينات القسطرة التشخيصية 66(74.16%) فأعطت نتائج موجبة للزرع الجرثومي لاختبار المسحات 15(22.73%) ،اما اختبار زرع طرف القسطار 14(21.21%) ،واختبار زرع عينة الدم 14(21.21%) قبل اجراء القسطرة و15(22.73%) بعد اجراء القسطرة ،اما عينات القسطرة العلاجية 15(16.85%) فكان المصابين منهم 6(40%) لكل الاختبارات ،اما عينات القسطرة التشخيصية والعلاجية معا 8(8.99%) فكان المصابين منهم 4(50%) ، 4 (50%) ،4(50%) و3(37.5%) على التوالي.

اظهرت النتائج قيم الحساسية 96% والنوعية 100% لاختبار المسحات وزرع طرف القسطرة ، اما قيم الحساسية والنوعية 100% و98.5% على التوالي لاختبار زرع الدم ،اصبح واضحاً من خلال نتائجنا ان 89 عينة يوجد منها 25 (28.09%) موجبة الزرع وعينتان منهن اظهرت نوعين من الجراثيم حيث يكون العدد الكامل 27 عزلة جرثومية ، فكانت 11(70.74%) للبكتريا الموجبة ، 15(55.56%) للبكتريا السالبة وعزلة واحدة فقط 1(3.70%) من الخمائر بينما 64(71.91%) لم تعطي اي نمو

الكلمات المفتاحية: المسببات المرضية ، القسطرة القلبية

Introduction:

Atherosclerosis (arterial lipoidosis) are the term used to describe a condition in which there are pool and the accumulation of fatty material along the walls of the arteries, these materials with the time become dense and strong ,with the potential for causing narrow or blockage of the arteries leads to weakness vitality and function of this organ (1).

latent autoimmune disease against endothelial cell in adult early in the course of the disease process was critical because high risk of infections agent , it has been found that most of viruses and bacteria have play important role in these cases (2). The biofilm tends to prefect the bacteria from the action of antimicrobial agent and makes treatment difficult (3).

Cardiac Catheterization was used to visualization the coronary arteries , the great vessel and the chambers of the heart (4). Although a number of diagnostic and therapeutic tools have been used in the treatment of heart and blood vessels disease , one of these tools is the cardiac catheterization mediated by a rubber tube inserted inside the blood vessels to reach to the right or left side of the heart to diagnose the condition or to fix the found problem, cardiac catheters use to diagnosis and treatment various cardiovascular cases (4). The catheter is inserted in to the groin or arm guided under fluoroscopy in to the heart in addition photo camera aid placed at the top of the catheter to viewed desired position (5).

Materials and methods:

A total of (89) samples of cardiac catheterization were selected from patient who attended the Imam Hussein Teaching Hospital in holy Karbala province ,during 7 months (January 2014 to July 2014) , cardiac catheterization of study population was classified into three types , diagnostic catheterization , therapeutic catheterization and both of them to gather the ,ages of those patient ranged from (29-75) years , from both sex and different residency , history of each patient was taken as the name of the patient , sex, age, blood pressure, blood sugar, fever, previous operations, catheter precedent, dialysis, current catheterization type, the use of antibiotics prior to sample collection, date of sampling , data were collected in regard to the person state according to the prepared case sheet .several swabs of cardiac catheterization tools (Catheter , Sheathe , GuideWire and Needle),in this manner , cotton swab was immersed on media and rotate the swab along the tool, transported directly to the laboratory for bacteriological investigation Figure (1) .

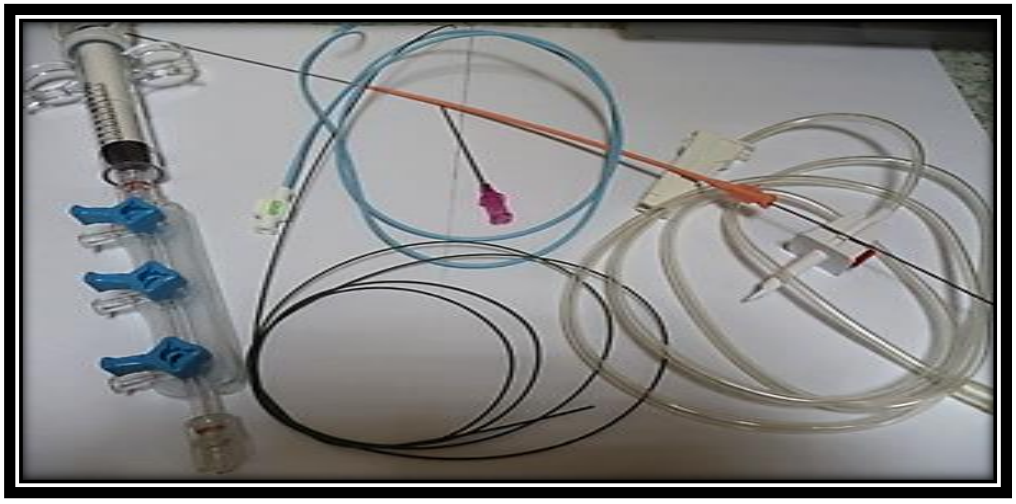

Figure (1) cardiac catheterization tools

catheter tip culture (semiquantitative technique) method an usually described according to the author (6,7)with some modulation. fifteen centimeter in length of catheter tip was after cutting by sterilized scissors , then catheter tip also constantly being cut into three pieces each pieces have length 5 cm was immersed in tube containing brain heart infusion broth and beside to the patient , catheter tip culture and swabs were transported to the laboratory , growth of terbing optimal aerobically and anaerobically in atmosphere containing added CO_2 for 24-48 hours at 37° C .

However , bacterial and fungal growth is indicated by obvious turbidity (mud growth) on blood and chocolate agar after streaked on an agar plate with a wire loop Figure (2)

Figure (2) catheter tip culture

Blood culture samples were collected from patient , tincture of iodine (2% solution of iodine) is used to prepare the skin prion to blood culture , because tincture of iodine can be irritating to the skin it should be removed with 70% ethanol . About 8 ml of blood was withdraw from patient in one arm ,so it also 8ml was drained from other arm . Blood samples for culturing are taken first to the laboratory by special transport media within hour after collection the blood was immersed in the

Bact ALERt 3D (BioMerieux /France) for 1-7 days , positive culture from blood agar examination was indicated wherever there is any special suspicion colonies.

Results and Discussion :

The results were showed that the test swabs were the number of patients with diagnostic catheterization 66 (74.16%) patients and infected 15 (22.73%), and therapeutic catheterization 15(16.85%) had 6(40%) infected of them while diagnostic and therapeutic catheterization 8(8.99%) patients was 4 (50%) of them patient infected in table (1).

Table (1) Percentages for the appearance of pathogens from cardiac catheterization samples by Swabs test

Type of sample / type catheterization	Swabs			
	Sample number	percentage	Sample positive number	percentage
Diagnostic	66	% 74.16	15	% 22.73
Therapeutic	15	% 16.85	6	% 40
Diagnostic and Therapeutic	8	% 8.99	4	% 50
Total	89	% 100	25	% 28.09

Results of catheter tip culture where the diagnostic catheterization was infected 15(22.73 %), and therapeutic catheterization of infected people 6(40%) , either two together was the number of infected people 4 (50%) table (2) .

Table (2) Percentages for the appearance of pathogens from cardiac catheterization samples by Catheter Tip test

Type of sample / type catheterization	Catheter Tip			
	Sample number	percentage	Sample positive number	percentage
Diagnostic	66	% 74.16	15	% 22.73
Therapeutic	15	% 16.85	6	% 40
Diagnostic and Therapeutic	8	% 8.99	4	% 50
Total	89	% 100	25	% 28.09

Also conducted blood culture test was performed to make sure the two previous methods had two stages: -

First stage: - it was done before a catheterization that diagnostic catheterization samples gave the 14 (21.21%) patients, and therapeutic catheterization was gave 6 (40%) patients either two together has given 4 (50%) patients was the number of people infected 24 (26.93%) patients.

Second stage: - it was done before a catheterization that diagnostic catheterization samples gave the 15 (22.73 %) patients, and treatment catheterization was gave 6 (%40) patients either two together has given 3(37.5 %) patients was the number of people infected 24 (26.93%) patients table (3).

Table (3) Percentages for the appearance of pathogens from cardiac catheterization samples by Blood culture test

Blood culture						
Type of sample / type of catheterization	Sample number	percentage	Sample positive number	percentage	Sample positive number	percentage
			Before		After	
Diagnostic	66	% 74.16	14	% 21.21	15	% 22.73
Therapeutic	15	% 16.85	6	% 40	6	% 40
Diagnostic and Therapeutic	8	% 8.99	4	% 50	3	% 37.5
Total	89	% 100	24	% 26.97	24	% 26.97

The study showed after samples culturing on enrichment and differential media , that out of 89 patient's (a common sample) gave 25 positive bacterial culture , and two of these samples showed the presence of two types of pathogens, 27 bacterial isolated, as 11(70.74%) isolates for Gram positive and 15 (55.56%) isolates for gram negative and 1(3.703) yeast ,in addition 64 (71.91%) sample no gave any growth in the table (4 and 5) .

Table (4) Percentages pathogens isolates from cardiac catheterization :

Types of pathogenic agent	Isolates number	percentage
gram Positive bacteria	11	% 40.74
gram negative bacteria	15	% 55.56
Yeasts	1	% 3.70
Total	27	% 100

Table (5) Percentages pathogenic of bacterial and fungal isolates from cardiac catheterization patients:

Types of germ	Isolates number	percentage
Bacillus spp.	2	% 7.41
S.aureus	4	% 14.81
S.epidermidis	2	% 7.41
S.pneumoniae	2	% 7.41
S.pyogenes	1	% 3.70
E.coli	2	% 7.41
K.pneumoniae	3	% 11.11
P.mirabilis	2	% 7.41
P.fluorescence	1	% 3.70
P.aeruginosa	2	% 7.41
Pantoea spp	1	% 3.70
Salmonella spp	1	% 3.70
Aeromonas hydrophila	1	% 3.70
Enterobacter cloacae	1	% 3.70
Serratia marcescens	1	% 3.70
C.albicans	1	% 3.70
total	27	% 100

Genera that were bacterial isolates included highest rate of *Staphylococcus aureus* as 14.81%, followed by *Staphylococcus epidermidis ,Streptococcus pneumoniae , Bacillus spp* 7.40% and *Streptococcus pyogenes* 3.70% .

The presence of these bacteria in large numbers from cardiac catheterization patient indicates the patient may be previously infected with these species , so occasionally it is possible to continue or recurrent bacteria due to the ability of these bacteria to resisted antibiotics and harsh extreme environment (8) infections affecting the heart valves include endocardia's primarily affecting the aortic and mitral valve when "viridans" streptococci are involved , however with I V drug users , *Staphylococcus aureus* is commonly encountered and usually right side valves are affected (9)

To second gram positive bacteria which causes bacteremia in our result was *Streptococcus pneumonia* (7.41%), pneumococci are normal inhabitants of the upper respiratory tract of 4-5% of humans and can cause pneumonia , meningitis , bronchitis and bacteremia , among the factor that probably lower or loss patient resistant immune cell and thus predispose to pneumococcal infection was viral or other respiratory tract infection and abnormal circulatory dynamics as (pulmonary congestion or heart failure) apically in the cardiac catheterization ,have a significant role in causing bacteremia children (10) .

The high reported incidence of gram negative bacteria was *Klebsiella pneumoniae* as 11.11%, followed by *E.coli , Proteus mirabilis* and *Pseudomomas aeruginosa* as 7.40%,while the lowest reported rate in our study *Pseudomonas fluorescence ,Pantoea spp , Salmonella spp, Aeromons hydrophila , Enterobacter cloacae* and *Serratia marcescens* as 3.70%.

Hospitalized patients in some cases demonstrated increased susceptibility to infection of *Pseudomonas aeroginosa* as a consequence of debilitation associated with concurrent illness and in some cases the adminstration of immunosuppressive drugs, also wide spread use of antibiotics promote over growth of antibiotic resistant strain of gram negative bacilli such as *pseudomonas aerginosa* these organisms are often resistant to many antibiotics , in addition to potential lipopolysaccharide responsible to cystic fibrosis (11).

Klebsiella pneumonia and gram negative rods, may be implicated this condition may occur at any age but is typically uncommon in cardiac catheterization patients and late life there are approximately more than one pathogenic factor and virulence factor that causes significant disease in humans during infection by *klebsiella pneumonia* , one of them capsular activity posses sophisticated virulence strategyie that are designed to over come phagocytosis , by prevent opsonization process (12).

Surprisingly , these bacterium have ability to resistant of some antimicrobial agent , farther more , pathogens that cause intestinal disorders and often nosocomial infections through hospital acquiredinfection in the genitourinary tract surgical wounds and lung all these are the most common sites of nosocomial infections (13).

The bacteria *P.aeruginosa* is the second of negative bacterial causes possibility of moving through the hands of the medical staff and patients (14). The most of the gram negative bacteria isolates are Enterobateriaceae, which access to the bloodstream through the lining of the intestines (15).

The finding of this study is similar to there studies (16) where it was found that gram negative bacterium transmission more than the gram positive bacteria and anaerobic bacteria, as well as ,it being resistant to antibiotics due to lack of permeability of the outer membrane to most antibiotics, on the other hand , the incidence of bacteremia may be result from repeated intravenous injection and fluids which prevent dehydration (17).

On the other hand its possession of virulence factors such as adhesion cells of the host and secretion of analytic enzymes and destroy the cells of the host when a immune system weakened of the host, which led to overcome the defense factors of the host and thus the invasion of host cells(18)

Strain of *Candida albicans* have been isolated as single isolation (3.70%) , the pathogen was grew as a parasitic yeast in the host and exogenously as a saprophytic pseudo hypha this apportumstic fungus can become a pathogen from oral pharyngeal mucosa , rectal mucosa and vaginal mucosa .other infections are also possible under certain conditions such as therapy with corticosteroid and /or immune suppressive agent that suppress lymphocytopoiesis during cardiac catheterization (19) .

Three methods were used for detecting the etiological agents of cardiac catheterization ,swabs , catheter tip culture ,and blood culture, The results showed an sensitivity value of 96% and specificity 100% for swabs testing and catheter tip, either sensitivity values and the specificity 100% and 98.5% to the blood culture test respectively table (6) ,the study funded that swab culture and catheter tip methods was sensitive to detect the agent.

table (6) sensitivity and specifeity values of three type of test :

Type of test	sensitivity	specificity
swabs	96%	100%
catheter tip culture	96%	100%
blood culture	100%	98.5%

One study have noted (6,7) that veins peripheral catheterization by catheter Tip methods is an indicator of the risk of bacteremia, this method was considered as a factor and proof of diagnosis infections related with catheterization (20), and confirmed by (21) .

The author (22) suggested that the semi-quantitative (catheter tip culture) method considered as standard for bacteria which adherence to the outer surface of the catheter, while some studies have shown that semi-quantitative method is able to distinguish bacteremia associated with catheterization (23).

Generally ,the present study also evaluated the diagnostic efficiency macroscopic , microscopic and biochemical test for each species according to the (24 ,25,26). API system designed for confirmation of infections agent have become available in this study for routine diagnostic use such as : API Staph , API Strep , API E20 and API Candida all of these characterized by easy , speed and available of reagent .

Candida has become one of the most common blood isolates as well as one of the leading causes of nosocomial blood stream infections (27), germ tube is an important virulence factor of *Candida albicans* because it helps the yeast to invade tissue and growth as fungal false filaments (28).

Refernces

1. **Roger, V . L.; Lloyd-Jones, G .O,; Adams, D. M.; *et al* . (2011).** Heart Disease and Stroke Statistics-- Update : A Report From the American Heart Association *Circulation* ,123:018-0209.
2. **Epstein, S. E.; Zhu, J.; Najafi, A. H.; Burnett, M.S.(2009).** Insights into the role of infection in atherogenesis and in plaque rupture. *Circulation*.,119:3133-41.
3. **Hall-Stoodley, L.; Stoodley, P.;(2009).** Evolving concepts in biofilm infections. *Cell. Microbiol.* 11:1034 –1043.
4. **Levine, G .N. ; Bates, E. R. ; Blan kenship, J. G. (2011).** guideline forbpercutaneous coronary inter vention : A report of the American college of cardiology foundation / American heart association task . force on practice guidelines and the society for cardiovascular angiography and interventions . *circulation.* , 124(23):574-651.
5. **Raingruber, B.; Kirkland-Walsh, H.; Chahon, N. (2011).** Using the mehran risk scoring tool to predict risk for contrast medium- induced nephropathy in patients undergoing percutaneous angiography . *critical care nurse* , 31(1) , 17-22.
6. **Maki, D. G.; Weise, C. E.&Sarafin, H. W.(1977).** A semiquantitative culture method for identifying intravenous-caheter-related infection. *N. Engl .J .Med.*, 296:1305-9.
7. **Stewart ,P.S.; Costerton, J.W. (2001)**. Antibiotic resistance of bacteria in biofilms. Lancet.;358:135-138.
8. **Mukoyor, M.; Mabiza, E. & Gould, I. M. (1985).** Staphylococcal bacteremia in Zimbabwe 1983. *J. Infect.*,10: 233-235.
9. **Schoen, F.J.(2004).**the heart in : kumar,V., Assass, A.K.,faustoN, Robbins & Corran pathologic Basis of Disease , 7thed .philadiliphia .
10. **French, G. L.; Cheng, A. F.; Dnthie, R. B. & Cockram, C. S. (1990).** Septiceamia in Hong Kong. *J. Ant. Chemotherapy*. 25:115-125.
11. **Enwere**, **G.; Biney, E.; Cheung, Y. B.; Zaman, S. M.; Okoko, B.; Oluwalana, C.; Vaughan, A. & Cutts, F. T. (2006).** Epidemiologic and clinical characteristics of community-acquired invasive bacterial infections in children aged 2-29 months in The Gambia. *Pediatr. Infect. Dis.J.*; 25(8):700-705.
12. **Levey, I.; Leibovici, L.; Druker, M.; Samra, Z.; Konisberger. H. & Ashkenazi, S. (1996)**. Aprospective study of gram-negative bacteremia in children. *Pediatr infect. Dis. J.*, 15:117-122.
13. **Sidjabat, H.; Nimmo, G. R.; Walsh, T. R.; Binotto, E.; Htin, A.; Hayashi, Y.; Li , J. ; Nation, R .L.; George, N.& Paterson, D. L.(2011).** Carbapenem resistance in *Klebsiella pneumoniae* due to the New Delhi Metallo-β-lactamase. *Clin. Infect. Dis.* 52(4):481-4.
14. **Nordbring, F. (1982).** *Pseudomonas* clinical problems related to virulence factors and development of resistance. *Arch. Intern. Med.*, 142: 2010-2011.
15. **Naaber, P.; Smidt, I.; Tamme, k.; Liigant, A.; Tapfer, H.; MikelSaar, M. & Talvik, R. (2000).** Translocation of indigenous microflora in an experimental model of Sepsis. *J. Med. Microbiol.*; 49:431-439.
16. **Jawetz, E.; Melnick, J. L. & Adebery, E. A. (1998).** Review of medical microbiology. 21st ed London altose: lange medical publications.
17. **Hossain, M .I.; Kabir, A. K.; Khan, W. A. & Fuchs, G. J. (1998).** *Acinetobacter* bacteremia in patients with diarrheal disease. Epidemiol. *Infect*., 120:139-142.
18. **Kumamoto, C. A.& Vinces, M .D. (2005).** Alternative *Candida albicans* lifestyles: growth on surfaces. Annu. Rev. Microbiol. 59:113-33.
19. **Calderone, R .A.& Fonzi, W. A.(2001).** Virulence factors of *Candida albicans*. Trends Microbiol. 9(7):327-35.

20. **Raad, I.I.& Bodey, G.P.(1992).** Infectious complications of indwelling vascular catheters. *Clin. Infect. Dis*., 15:197-210.
21. **Bouza, E.; Muñoz, P.; López-Rodrígues ,J.; Jesús Pérez ,M.; Rincón, C.;Martín Rabadán, P.; Sánchez, C.& Bastida, E.(2003).** A needleless closed system device (CLAVE) protects from intravascular catheter tip and hub. *J. Hosp. Infect*., 54:279-87.
22. **Fätkenheur, G.; Buchleidt, D.; Cornely, O. A.; Fuhr ,H. G.; Karthaus, M.; Kisro, J. ; Leithäuser, M.; Salwender, H.;Südhoff ,T.;Szelényi, H.& Weissinger, F.(2003).** Central venous catheter (CVC)-related infections in neutropenic patients. Guidelines of the infectious diseases working party (AGIHO) of the German Society of Hematology and Oncology (DGHO). *Ann. Hematol.*, 82:149-57.
23. **Blot, F.;Schmidt, E.; Nitenberg, G.;Tancrede, C.; Leclercq, B.; Laplanche ,A.& Andremont, A.(1998).** Earlier positivity of central venous versus peripheral blood cultures is highly predictive of catheter-related sepsis. *J. Clin. Microbiol*., 36:105-9.
24. **MacFaddin, J . F. (2000).** Biochemical Tests for Identification of Medical Bacteria 3rd ed. Lippincott Williams and Wilkins, USA.
25. **Forbes, B. A. ; Daniel, F. S& Alice, S .W.(2007).**Bailey and Scott's Diagnostic Microbiology . 12th ed. ,Mosby Elsevier company . USA .
26. **Jawetz, M. A. ; Brooks, G. F.; Butel, J. S. & Morse, S .A. (2010).** Medical microbiology. 25th ed., Lang medical, McGraw-Hill, USA.
27. **Ellis ,D. Stephen ,D. ; Helen, A.; Rosemary ,H.& Roben, B.(2007).** Description of medical fungi second edition.
28. **Consolaro, E.L.; Albertoni, T.A.; Svidzinski ,A.E.; Peralta, R.M. (2005).**Vulvovaginal candidiasis is associated with the production of germ tubes by *C.albicans*.Mycopathologia ,159: 501-507.