LEFT VENTRICULAR THROMBOSIS WITH PERIPHERAL EMBOLIZATION IN SEVERAL VASCULAR ZONES – CLINICAL CASE

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INTRODUCTION

Left ventricular (LV) thrombosis is a serious complication that is associated with high risk of systemic embolism and mortality [1]. The most common reason in the last several decades was considered to be myocardial infarction (MI) and realized extensive cicatricial zone. Due to the development of interventional cardiology and improved drug therapy, the cases of LV thrombosis following a coronary event...
are now relatively rare. [2] In recent years, the establishment of thrombus in the cavity of the LV is mostly associated with severe systolic dysfunction. According to data from McCarthy et al, after an analysis of over 140,000 patients, there were 128 cases diagnosed with LV thrombosis. The main risk factor is considered to be the presence of HF in 68.5%, as in 86% of them the ejection fraction (EF) was below 40% (Fig. 1A) [3]. Anticoagulant therapy with warfarin and target INR > 2.0 were initiated in 84.4% of the patients (Fig. 1B). Anticoagulant therapy was not administered in the remaining 20 patients due to contraindications.

The results of this follow-up strongly suggest that severe systolic dysfunction is associated with an increased risk of intracavitary thrombosis, resulting in 10% mortality during the first year after its establishment. This requires an active follow-up and treatment of this high-risk group of patients.

The formation of thrombi in the cavity of the LV occurs in the presence of predisposing factors known as Virchow’s triad, namely: local myocardial or endothelial damage, blood flow stasis with reduced systolic function and chamber dilatation and the presence of a procoagulant state [4]. The combination of individual factors such as realized myocardial infarction, blood stasis in the dilated LV cavity and a proinflammatory state can lead to the development of a different clinical manifestation, as well as to affect the outcome of the treatment.
**CLINICAL CASE**

History. A 49-year-old patient is admitted to the Emergency Department with progressive shortness of breath and intermittent chest discomfort for several days. Since approximately 10-12 hours, he has pain in the left lower limb and reduced sensitivity in both hands. The previous days he has had subfebrility up to 37.8°C. According to relatives, the patient consumes alcohol daily. Due to ECG data for acute coronary syndrome (ACS), he is admitted to the cardiology ward at University Hospital – Burgas.

Clinical status. From the general status, we find a man in severe general condition, somnolent, subfebrile. The skin is pale with pronounced cyanosis on the nose and lips and with present cervical venous congestion. On auscultation, the lungs are congested with scattered various moist rales. Cardiovascular status shows a tachycardic heart rate with a holosystolic murmur at the apex, as all four limbs are pale and cold with cyanosis on the toes, and the left leg has “marbled” skin above the knee. Palpation of the peripheral arteries shows: greatly weakened pulsations of the left and right brachial arteries, absent pulsations of the radial and ulnar arteries bilaterally, absent pulsations of the left popliteal artery and attenuated pulsations of the right tibial artery.

Echocardiography. The echocardiography data established a dilated, spherically remodeled LV with severely depressed systolic function. LV volumes were measured: end-diastolic volume (EDV) 186 ml, end-systolic volume (ESV) 150 ml, as the calculated LV ejection fraction (EF) according to Simpson’s Method was 20% (Fig. 2). High-grade mitral regurgitation with a central jet and vena contracta (VC) – 8 mm were visualized; Right cavities were not dilated with indirectly measured pulmonary artery systolic pressure (PASP) – 30 mmHg; Inferior vena cava was dilated with absent respiratory collapse. From the parasternal short-axis position (PSAX), a formation, trapped at the posterolateral wall in the area of the papillary muscle chords, was visualized. The structure was moderately echogenic and measured 23/17.5 mm, suspicious for thrombosis.

Clinical laboratory results. The laboratory tests revealed pronounced leukocytosis up to 22.9 g/l, creatinine 233 mmol/l, total bilirubin 31 mmol/l; ASAT – 2014 U/I; ALAT – 640 U/I, GGTP – 217 U/I, KK – обща – 2120 U/I, CK-MB – 164 U/I, hsTropinin > 50 000 pg/ml. The rapid antigen test for COVID-19 was negative. Due to ECG evidence of STEMI of the left ventricular inferior wall and elevated markers of myocardial necrosis, it was decided to perform selective coronary angiography.
Тромбоза в лявата камера с периферна емболизация...

Клинично обсъждане и диференциална диагноза. При постъпването си пациентът беше сомнолентен и трудно отговаряше на зададените въпроси. По данни на близките от 1 ден до покрая е със задух, болка в гърдите и крайниците, което ни насочи към водеща диагноза остра миокардна истемия с тласъчно протичане. Поради наличие на персистираща елевация на ST-сегмента на ЕКГ в долни отведения се прие първоначална водеща диагноза STEMI на ДСЛК. Според препоръките на European Society of Cardiology (ESC) терапевтичната стратегия при тези пациенти е максимално бързо реваскуларизиране на оклудираната артерия [5]. Въпреки че клиниколабораторната констелация на маркерите за миокарда некроза предполага вероятна давност на исхемията над 12 часа, наличието на стенокардна симптоматика при хоспитализацията оправдава пристъпване към реваскуларизацияция стратегия. Повишените нива на трансаминазите са с ниска специфичност за миокардна некроза [6]. Тяхната динамика може да се свърже както с остра алкохолна интоксикация през предходните няколко дни, така и с периферната миолиза в резултат на исхемията на крайниците. Поради това промяната в стойностите им не се взе под внимание при формиране на терапевтичната стратегия. При постъпването пациентът е с ЕхоКГ данни за тежка левокамерна дисфункция при дифузно потиснат контрактилитет и увеличени обеми на сърдечните кухини. Предвид анамнезата вероятно се касае за алкохолна дилатативна кардиомиопатия. Въпреки това не може да се изключи налагане на миокардна исхемия като утежняващ систолната дисфункция фактор. Поради налични ЕхоКГ данни за левокамерна тромбоза и периферен съдов статус за реализирани емболии се реши да се проведе коронатна ангиография и периферна ангиография с достъп от дясна феморална артерия.

Фиг. 2. Ехокардиографска картина на тромбозата в лява камера на ниво на постеролатерален папиларен мускул

Fig. 2. Echocardiographic picture of the LV thrombosis at the level of the posterolateral papillary muscle

Clinical discussion and differential diagnosis. On admission, the patient was somnolent and had difficulty answering questions. According to relatives, for the past 24 hours he has had shortness of breath, pain in the chest and limbs, which directed us to leading diagnosis of acute myocardial ischemia with rapid flow. Due to the presence of persistent ST-segment elevation on the ECG in the inferior leads, an initial leading diagnosis of STEMI of the left ventricular inferior wall was accepted. According to the recommendation of the ESC (European Society of Cardiology), the therapeutic strategy in these patients is to revascularize the occluded artery as quickly as possible [5]. Although the clinical-laboratory constellation of myocardial necrosis markers suggests a probable duration of ischemia greater than 12 hours, the presence of angina symptoms at the time of hospitalization justifies the proceeding to a revascularization strategy. The elevated levels of transaminases are of low specificity for myocardial necrosis [6]. Their dynamics can be associated both with the acute alcohol intoxication in the previous couple of days and with peripheral myolysis as a result of the limb ischemia. For this reason, the change in their laboratory values was not taken into consideration in the formation of the therapeutic strategy. On admission, the patient has echocardiographic data for severe left ventricular dysfunction with diffusely suppressed contractility and increased volumes of the cardiac cavities. Considering the anamnesis, it is probably alcoholic dilated cardiomyopathy. However, the superimposition of myocardial ischemia cannot be excluded as an aggravating factor for systolic dysfunction. Due to already present echocardiographic data for left ventricular thrombosis and peripheral vascular status for realized emboli, it was decided to perform coronary angiography and peripheral angiography with right femoral artery access.
Invasive investigation. The conducted procedure revealed distal thrombotic occlusion of the OM and balloon dilatation was performed with an optimal angiographic result (Fig. 3, Fig. 4).

The peripheral angiography established acute thrombosis of a. poplitea sinistra. During the procedure the patient is in severe general condition and due to persistent hypotension, catecholamine drugs were administered. This led to the necessity of making an immediate decision for the therapeutic strategy. The patient was assessed as high risk and therefore not appropriate for hybrid procedure of one-stage coronary angioplasty and peripheral embolectomy performed in conjunction with a team from the Vascular Surgery Department.

Invasive treatment. After several unsuccessful balloon dilatations of a.poplitea sinistra, a perfusion catheter was placed for prolonged fibrinolysis. Actylise in a dose of 8 ml bolus was administered, followed by an infusion of 1 ml/hour for 24 hours (Fig. 5), as well as an infusion with unfractionated heparin at a dose of 750 UE/hour. The control angiography after 24 hours revealed passable a. poplitea sinistra, free of thrombi (Fig. 6). A. tibialis anterior and a. peronea were seen recanalized to the middle of the lower leg where they were remained occluded, and their blood supply zones were covered by a poorly defined collateral network. The left anterior tibial artery was passable along its entire length.

After the administered prolonged fibrinolysis, the patient’s therapy was continued with anticoagulant treatment with unfractionated heparin with target APTT 50-70 msec for the next 48 hours, after which it was switched to fractionated heparin in therapeutic doses. On control echocardiography, it was established severely reduced volume of the thrombotic mass in the
Също така, освен подобрената перфузия на левия долен крайник, двете ръце и десния крак също бяха с подобрео оросяване, розов цвят на кожата и с нормална температура. Левия крак бе с ясна демаркационна линия на исхемия в областта на метатарзалните кости с реализирана некроза на пръстите.

След стабилизиране на хемодинамичните показатели и постепенно нормализиране на стойностите на креатинин, трансаминали, билирубин, креатин-кимиазата, CK-MB и тропонин, пациентът се преведе в Клиника по съдова хирургия за оперативно лечение на остатъчната некроза на стъпалото (фиг. 7).

Проследяване. От контролната ЕхоКГ при деконсолидацията се установи подобрео систолна функция на ЛК, ФИ 35%. Персистира високостепенна митрална регургитация. Лявата камера се визуализира свободна от тромботични маси. За дома се препоръча оптимална терапия за сърдечно-съдови недостатъци с бета-блокер, минералкортикоиден рецепторен блокер, ARNI и SLGT2 инхибитор. По време на болничния престой от 20 дни пациентът беше LV, with remaining parts trapped in the exit zone of the chords, originating from the head of the posterolateral papillary muscle.

Also, apart from improved left lower limb perfusion, the irrigation of both hands and the right leg was improved with pink color on the skin and normal temperature. The left leg had a clear demarcation line of ischemia in the area of the metatarsal bones with realized necrosis on the foot.

After stabilization of the hemodynamic indicators and gradual normalization of levels of creatinine, transaminases, bilirubin, creatine kinase, CK-MB and troponin, the patient was transferred to the vascular surgery clinic for operative treatment of residual foot necrosis (Fig. 7).

Follow up. From the control echocardiography at discharge, it was established improved LV systolic function, EF 35%; high-grade mitral regurgitation persisted. The left ventricle was seen free of thrombotic masses. For home treatment, it was recommended optimal ther-
Blood flow stasis in the areas of compromised contractility in patients with reduced LV systolic function takes a central role in formation of thrombotic masses [7]. On the other hand, local damage to the endocardium due to myocardial necrosis also contributes to activation of the coagulation cascade and predisposes to blood clot formation.

In this clinical case, we believe that the main reason for LV thrombosis formation was the severely suppressed systolic function of the heart. Although an acute coronary event has occurred, the ischemic zone is relatively small to provoke local blood stasis and endomyocardial damage. After clinical discussion, it was decided that the acute coronary event is a result of an embolus from the LV thrombus, and that its migration to the periphery of the left circumflex artery led to dynamic development of the clinical manifestation. The lack of angiographic data for atherosclerotic changes in the other vessels confirms our thesis for an isolated embolic event. As for the emboli in the peripheral arteries, they probably occurred the previous couple of days prior to hospitalization, as those in a. tibialis anterior and a. peronea are likely to be with the longest duration, which consequently can be a reason for the persistence of the occlusion, in spite of the fibrinolytic treatment. The poor collateral network in this zone also supports the thesis. This led to the realization of the necrosis, which resulted in the foot amputation.

According to the recommendations of the ESC, patients with STEMI undergoing fibrinolysis without subsequent angioplasty are subject to antiplatelet therapy with clopidogrel for a period of 1 month thereafter [8]. During the hospital stay of 20 days, the patient presented by us is on antiplatelet prophylaxis with clopidogrel. Because of the high risk of bleeding and the unclear status of the porto-caval collateral network in relation to chronic alcohol abuse, it was decided to keep the patient on an oral anticoagulant monotherapy after discharge.
Komb momenta preporykyte socat kъm izpolzva-
ne na vitamin K-antagonistite za lechenie i profi-
laktika pri levokamernata trombosa [5]. Zasega ima
oskodni danny ot dokladvani odjeli klinichni slu-
cha za efekta na direktnite oralni antikoagulantii
pri tazi pacienti [9, 10, 11]. Pri predstavlenia
na nas pacient, sled pravdovata fibrinoliza i obzi-
daz Aktilyzite od 30 mg za 24 часа, se postovaying pote-
plno izhevane na trombotichnata masa v levata ka-
mera. Vypriki che trombolsitata behe nasohena k
periferikyce svidova emblizi, liziraneto na trom-
ba v levata camera namali riska ot svedovachi
podobi incidenti pri tozi kompliyiran slu chast.
Poradi tova ekipnii nii rechi da naznachi direkten
oralni antikoagulant za lako ot 3 mease sa chel da
d se profilaktikira sledovavela tromboobrazuwan
v levata camera. Svered deistavashite preporyky
oralny antikoagulant trebva da se spere sled li-
ziiraneto na tromboobrazuwan, kato se preporychva
sledovavela izhevanje

Osven kompromornata sistemna sistoma na LF,
kotovo verno ot da vozna na formiraneto na trom-
obichnata masa, trebva da se vzemi pod vne
i klinichna etiologiiya i anamnezata za sistemna alko-
holna zloupotrebba ot pa-
cienta. Redica izhedeniya podkrepljata tezata za vroz-
kata mezhunterochny izhevanie i razvitieto na pro-
infiamatornata sistoma v organism [13]. Hajronchi-
ny izhevanie vodi do sistemna dehjudacija i aktivir-
ae na sistemata na komplementa i drugi proizvaz-
teli signalni pti chto [14]. Na skoro pravod meta-
analiz pokazva sinnifikantno pokachane na nivatata
na vyzvalnitelchite citokiny kotot IL-6 (interleukin-6 ), IL-7
(interleukin 7), IL-8 (interleukin 8) i TNF-a (tumor necrosis
factor-alpha)  na pacienti s cysistemna alkoholna zlu-
opotrebba v slanenje na kontroli [15].

Pacientt, koi podstavlaya, behe v tezhko ochto
sostoanie, koeto nalazhata vzemanie na neslabno re-
shenie za terapevdtichno povedenie. Svered interdis-
ciplinarno obsegnane da se rechi da se predpra
me strategiya za lechenie s katetet-vasochena tromboliza,
a ne otvorenata operativna revaskularijazaciya. Tozy
pojdot se predfchete poradii klinichnata kartina na
teka sredchesna nedostatchnost, slystvstana ot ostra
isheimia na potki chelea lev dolen kranik, klas IIB
po Rutherford [16], kako i distalni isheimichni zoni i
ostanali kranichii. Csyo takoe behe nalichica
razvivasha se klinichna kartina na ostra bercena i
cher

Ostrata isheimia na deden kranik y e dramatichno
i chesto zivototazhchavate sostoanie. Naj-chesta-
ta причина e nalichieto na arterialna trombosa,
kotovo se postavitata pri nad 85% ot sluchate [17].
Prez srednata na 1970 g. Dotter et al. vyejdjet metoda
na intraarterialnata kateh-vasochena trombolizi-
za [18]. Prez poslednite 20 godini tova stava edin
ot shiroko prilaganyte i usheni metodi za lechen-
ie na pacienti s ostra isheimia na kranik, katot
Currently, the recommendations point to the use
of vitamin K antagonists for treatment and prevention
of left ventricular thrombosis [5]. So far, there is little
data for the effect of direct oral anticoagulants in these
patients from reported individual clinical cases [9, 10,
11]. In the patient presented by us, after the local fibri-
nolysis with cumulative dose of Actilyse of 30 mg per
24 hours it was established almost complete disapp-
pearance of the thrombotic mass in the left ventricle.
Although thrombolysis was directed at peripheral em-
boi, left ventricular thrombus lysis reduced the risk of
subsequent embolic events in this complicated case.
Therefore, our team decided to prescribe a direct oral
anticoagulant for a period of 3 months in order to pre-
vent subsequent thrombus formation in the left ventri-
cle. According to current guidelines, oral anticoagulants
should be stopped after thrombus lysis, and follow-up
with regular echocardiography is recommended [12].

In addition to the compromised LV systolic func-
tion, which probably is the basis for the formation of
the thrombotic mass, the patient's history of system-
ic alcohol abuse should also be taken into account. A
number of studies support the thesis of the relationship
between the chronic alcoholism and the development
of a proinflammatory state in the body [13]. Chronic al-
coholism leads to systemic dehydration and activation
of the complement system and other proinflammato-
ry signaling pathways [14]. A recently conducted me-
ta-analysis shows a significant increase in the levels
of inflammatory cytokines such as IL-6 (interleukin-6),
IL-7 (interleukin 7), IL-8 (interleukin 8) and TNF-α (tu-
mor necrosis factor-alpha) in patients with systemic alco-
hol abuse compared to controls [15].

The patient we present was in a severe general
condition, which led to the necessity of an immediate
decision on therapeutic strategy. After interdiscipli-
nary discussion, it was decided to undertake a treat-
ment with catheter-directed thrombolysis, rather than
open surgical revascularization. This approach was
preferred due to clinical manifestation of severe heart
failure, accompanied by acute ischemia of almost the
total left lower limb, Rutherford grade IIB [16], as well
as distal ischemic areas in the remaining limbs. The
developing clinic of acute renal and hepatic failure of
complex etiology was also present.

Acute lower limb ischemia is a dramatic and often
life-threatening condition. The most common cause
is presence of arterial thrombosis, found in over 85%
of the cases [17]. In the mid-1970s, Dotter et al. in-
roduced the method of intra-arterial catheter-based
thrombolysis [18]. Over the past 20 years, it has be-
come one of the widely applied and successful meth-
ods of treating patients with acute limb ischemia, with
Изводи

Левокамерната тромбоза е животозастрашаващо състояние с многофакторна етиология. Реализирането на периферна емболизация е усложнение, влошаващо прогнозата при тези, и без това, високосърдечни пациенти. Катетер-базираната тромболиза, съпровождана от антикоагулантна терапия, е метод на избор при тази група пациенти, като предизвиква високо ризикови пациенти. Катетер-базираната тромболиза, асоциирана с остра симптоматика на оклузия на артерия, където да се свърже съдовия графт. Ето защо пациентите с остра симптоматика на оклузия на артерия дистално от a. rch n 1 катетер-базирана тромболиза.

Не е деклариран конфликт на интереси

References


success rates confirmed by a number of randomized trials and meta-analyses [19, 20].

The thrombolysis of occlusions in the tibial artery is not as successful as in larger vessels [21]. On the other hand, these patients are not suitable for bypass surgery due to the lack of a good periphery where the vascular graft can be connected. Therefore, patients with acute symptoms of arterial occlusion distal to the popliteal artery because of a thrombus should be considered for catheter-based thrombolysis.

Conclusions

LV thrombosis is a life-threatening condition with a multifactorial etiology. Peripheral embolization is a complication that worsens prognosis in these already high-risk patients. Catheter-based thrombolysis, accompanied by anticoagulant therapy, is the method of choice, and this strategy has proven effective and leads to improved prognosis.

No conflict of interest was declared