Morphological features of heart damages caused by national Uzbek knives

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Introduction

Injuries caused by sharp objects include injuries caused by stabbing and cutting weapon [3, 15]. Damage to the heart by stabbing-cutting weapon is more common than other organs, and the lethality from it exceeds 90 % [17].

The prevalence of cases of the use of sharp objects for the purpose of murder or suicide is quite heterogeneous in the world. Thus, an analysis of 30 years of observation data in the city of Brescia (Italy) showed that 131 deaths were committed with the use of such objects, of which 92 were murders, 28 were suicides, and 11 were accidents. In the case of murders, wounds were mostly found in the left part of the front abdominal wall [21].

Monitoring in the city of Melbourne (Australia) from 2001 to 2014 revealed 56 cases of murder. In 45 cases, a cut wound was found in the chest area. Localization on the left side also prevailed [2].

In Bexar County, Texas (USA) from 1988 to 2010, 418 deaths were committed with the use of sharp objects, of which 349 were murders. In most cases, damage to the heart and lungs was detected. The average number of wounds was 5.3 [8].

An analysis of data from Denmark for the years 1992-2016 showed that in 75 % of murders committed with the use of a sharp object, there was damage to the heart and lungs (in particular, the pericardium and the occurrence of hemo- and pneumothorax, respectively). In 18.9 % of cases, the deceased had one injury in the chest wall. The most common item was a kitchen knife [19].

Thus, the greatest interest in the case of the use of sharp objects causes damage to the heart. An interesting fact is that according to the data of modern research most knife blade characteristics remain unaltered by heat, except for floor angle and slope height of cut. Such is the conclusion of an experimental study conducted by Lukas Waltenberger and Holger Schutkowski [22].

The study of soft tissue objects is a more difficult task for conducting experimental research. Compared to bone objects, which even after exposure to high temperatures
can fully convey all the details of a sharp object that caused damage [20]. Soft tissue objects, such as the heart, can change their dimensions in the postmortem period and thus deform the picture of the damage.

However, the morphological pattern of the heart and peritoneum damage, as well as damage to the parietal pleura and the specific pattern of a sharp object, have not been studied enough [6, 13]. Although the size, shape, and defects of a sharp object are well reflected in the heart, there are no clear guidelines and recommendations in the literature for assessing pathomorphological changes in the myocardium in stab wounds of the chest with a sharp object [7, 9].

Thus, by combining the actualities given by us, it can be noted that there is a need to determine the features of the morphological and metric signs of stab wounds of this organ, caused by the national Uzbek knives “pichak”, from the impact of which non-fatal and fatal injuries occur in various regions of the Republic of Uzbekistan, as national Uzbek knives have their characteristic design features [1].

**Purpose of the work:** to analyze features of the morphology of heart stab wounds caused by national Uzbek knives.

### Materials and methods

The study included materials from 30 people who died as a result of trauma caused by stabbing and cutting tools with damage to the heart, caused by national Uzbek knives. Of these, 21 of the dead were men, and 9 were women; the age of the victims was from 18 to 61 years. In 26 cases, there were single wounds, in 3 cases there were double wounds of the heart, in one case, a heart injury occurred as a result of three impacts with a piercing-cutting tool.

The study used materials from 30 people who died as a result of three impacts with a piercing-cutting tool. Skin wounds were often located in the region of the ventricles, in four (13.4 %) cases, in the region of the atria. Skin wounds were 0-1 cm long in one (3.3 %), 1-5 cm in twenty-eight (93.3 %), 5-8 cm in one (3.3 %), width 0-1 cm in twenty-seven (90.0 %), 1-5 cm - in three (10.0 %) cases, and heart wounds: 0-1 cm in five (16.6 %), 1-5 cm - in twenty-one (70.0 %), 3-5 cm - in four (13.4 %) cases, the width of the wounds in all thirty (100 %) cases were 0-1 cm.

Skin wounds in eleven (36.7 %) cases most often had a sickle-linear shape, in four (13.3 %) - angular, in ten (33.3 %) - arcuate-linear, linear - in five (16.6 %) cases. Heart wounds in eleven (36.7 %) cases had an angular shape, in twelve (40.0 %) - oval, in seven (23.3 %) - crescent-linear. When studying the direction of the wound channel, they were located perpendicularly, vertically, obliquely or at an angle to the surface of the heart. In cases where the channel was located in an oblique direction, the width of the blade was judged by the size of the cross section of the wound channel. During a normal examination, the walls of the wound channel were relatively smooth, and a stereomicroscopic examination revealed small irregularities due to the structure of the muscle tissue.

With a penetrating wound of the heart, the following was noted - the lesions on the skin and cardiac muscle had smooth, well-matched edges. In a stereomicroscopic study, the butt ends were Π-shaped in nine (30.0 %) cases, Π-shaped in four (13.3 %), T-shaped in five (16.6 %), and rounded Π-shaped in twelve (40.0 %) cases. The blade ends of the wounds in twenty-eight (93.3 %) cases were sharp, in five (16.7 %) cases additional injuries were noted in the form of parallel linear cuts in two (6.7 %) cases and tears in three (10.0 %) cases. Tears gave the blade end of the wound an Π- or T-shape; they differed from incisions in uneven edges.

The edges of the wound channel from the action of the blade are sharp, and, according to the action of the butt of the blade, they are Γ-, Τ-, Π-shaped, sometimes rounded. On the walls of the wounds, hemorrhages were noted in twenty-two (73.3 %) cases.

Damage to the heart sac was studied from its inner surface, since the study of the outer surface was not possible due to fat deposits. Damage to the heart sac had a slit-like or fusiform shape. According to the action of the butt of the blade, the ends of the cut were Π-shaped or rounded. As you know, the collagen fibers of the pericardium are arranged in two layers. In one of them, the end of the incision was Π-shaped, in the other, it was rounded or sharp. In this case, sometimes the tissue fibers of one layer overlap part of the wound opening in another layer. The ribs of the wound channel at the blade ends were sheer or gentle, at the butt ends - sheer or overhanging.

In our study, several features were found in the wall of the heart, which, compared with skin wounds, have a higher morphological identification significance. As a result of morphological studies, the following was revealed that skin wounds after restoration in Ratnevsky solution No. 1 decrease in length and become shorter by 3-13 mm as a
result of elastic fiber contraction. After restoration in Ratnevsky's solution No. 1, the wall of the heart with damage deformed less than skin wounds (2-3 mm), this was due to the thickness and structural features of the myocardium.

The results obtained indicate that the length of stab-cut wounds of the heart, in comparison with skin wounds, more accurately corresponds to the width of the blade of a stab-cutting weapon. This may be due to the peculiarities of the structure of the epicardium and myocardium, which are less susceptible to the process of retraction.

Discussion

Thus, stab wounds were more common in men, the wounds were mainly in the ventricles and less often in the atria. Stab wounds caused by Uzbek national knives have an angular, oval, linear shape. The butt ends are Π-, Г-, T-shaped, the blade ends are sharp. The data obtained by us confirm the results of studying the morphological features of stab wounds, which allow us to believe that the retraction of lesions on the parietal pleura, heart sac, epicardium and heart muscle is much less than the retraction of skin wounds. As a result, they more accurately reflect the width of the knife blade. In addition, the design features of the butt and blade of knife blades are quite fully determined on the tissues of the heart, so they can be used for group identification of a traumatic tool [6]. When injured using a serrated knife, grooves can be found on the wall of the wounds from the points of notches on the edge of the blade. Evaluation of grooves in soft tissues is a means of identifying a tool that has a serrated blade. To do this, the walls of the stab wounds were exposed, documented by photography and cast using an impression material used in dentistry. The grooves were not identified in the wound marks obtained from knives with a smooth blade [15]. The grooves on the wall of the wounds were visible in experimental wounds in the liver, heart and aorta of animals. When studying stab wounds, it is proposed to open the walls of a stab wound in order to find the striation of the tissue to identify a tool with a serrated blade [14].

In general, the problem of describing injuries caused by sharp objects remains relevant for forensic medicine even today. Even the use of modern instrumental research methods does not allow to avoid such simple mistakes as the use of non-standard damage terminology [11].

References


Морфологічні особливості пошкоджень серця, завданих національними узбецькими ножами


Ключові слова: узбецький національний ніж, колото-різані рана, шкіра, серце.