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EXPERT ASSESSMENT OF KIDNEY DAMAGE DURING BLUNT TRAUMA

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Abstract: The article presents general information about the state of the issue of expert assessment of kidney damage due to blunt trauma, anatomical and topographical features of the kidneys, and the results of a pilot study on modeling damage to an isolated organ with various types of deformation. A number of morphological characteristics of the emerging areas of compression and expansion have been identified, reflecting the type of organ deformation.

Keywords: Blunt trauma, enal injury, method, surface of the injury.

INTRODUCTION

A large number of works are devoted to the issues of forensic medical assessment of the mechanisms of damage formation, carried out mainly to interpret the mechanogenesis of skeletal bone fractures. A few dissertations are devoted to the issues of expert assessment of the mechanisms of formation of injuries to internal organs, which make it possible to resolve only part of the issues in cases of injury to the spleen, liver and kidneys. Based on the above, it seemed appropriate to us to conduct a study devoted to the characteristics of damage to a parenchymal organ that has dense parenchyma, depending on the mechanism of injury and the types of deformation that it experiences. We chose the kidney as the organ under study.

MATERIALS AND METHODS

According to various authors, with closed blunt combined trauma, kidney damage is up to 60% (Sapozhnikova M.A.). Kidney damage often occurs in road accidents, falls from great heights, and impacts from blunt hard objects with a limited impact surface. For the formation of kidney damage during blunt trauma, direct impacts with a blunt hard object with a limited impact surface are of great importance. Rare mechanisms of injury include kidney damage due to a sharp contraction of the lumbar muscles with dislocation of the kidney from its bed, which can be observed when lifting heavy weights in athletes [1,2].

RESULTS AND DISCUSSION

The anatomical and topographical features of the kidneys create certain possibilities for injury by blunt objects. First of all, it should be noted that they are quite firmly fixed in place, and their mobility is quite limited. The anatomical structure of the kidneys with a pronounced network of blood vessels determines the possibility of the formation of extensive hemorrhages in them and disruption of the integrity of the tissue during injury. These same anatomical features of the kidneys create the possibility of developing a hydrodynamic effect in them (under traumatic influence), leading to significant destruction of the organ. Mazin V.V. indicates the possibility of the formation of traumatic injuries to the kidneys with certain variants of their vascular system, for example, with the extrarenal or intraorgan location of the vessels.

Due to the greater protection of the right kidney (topography of location), compared to the left, it is less vulnerable to compression of the body and is not accompanied by displacement under the influence of traumatic objects.

The analysis of the anatomical and topographical features of kidney injuries allows us to state that the features of the formation of kidney damage, more than in injuries to other organs, are significantly influenced by a number of objective factors: the degree of development of subcutaneous fatty tissue and back muscles; filling the gastrointestinal tract; increased intra-abdominal pressure; pathological processes preceding injury, primarily cysts and hydronephrosis; the presence of various kidney tumors, stones in the pelvis; various variants of the structure of the kidneys, especially the extrarenal or intraorgan location of their vessels.

The material for the study was data from an experimental study on modeling damage to an isolated organ with various types of deformation. A total of 5 experiments were conducted in each study group.

In the first group of injuries, the kidney was experimentally subjected to transverse bending relative to its middle part, resulting in the formation of transverse ruptures of the capsule and parenchyma on the convex side due to excessive overstretching in this area. In this case, a number of morphological features were discovered. Depending on the strength and duration of the impact, the resulting rupture extended to different depths. At its greatest strength and duration, it spread to the pelvis. The edges of the resulting gap were relatively smooth, well comparable and vertical relative to the surface of the organ; rupture of the kidney capsule corresponded to rupture of the organ parenchyma. In most cases, parallel tears of the capsule and parenchyma of the organ with similar properties were formed on the sides of the main rupture. The rupture surface consisted, in accordance with the morphological structure of the renal cortex and medulla, of many columns running perpendicular to the renal surface, which were clearly visible macroscopically and using a stereomicroscope.

In the second series of experiments, the kidney was subjected to local impact with a hard blunt object with a limited impact surface in its middle part in the transverse direction. At the same time, depending on the force of impact, damage was formed from subcapsular ruptures of the parenchyma to almost complete division of the organ into two parts.

CONCLUSION

Thus, the above allows us to conclude that the nature of kidney damage reflects the type of deformation that the organ experienced at the time of injury, and the resulting zones of compression and stretching of the parenchyma. Consequently, the morphological features of damage may indicate a specific mechanism of their formation. Our study allows us to come to the conclusion that the process of stretching of the kidney parenchyma is characterized by the formation of tears with smooth, steep edges, well comparable to capsule ruptures, corresponding to parenchyma ruptures and the formation of the surface of the ruptures, which completely reflect the structure of the kidney in the form of columns, the formation of capsule tears and renal parenchyma running parallel to the main rupture.

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