

Morphology

Various morphological changes in the liver related to and resulting from prolonged intravenous heroin use

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Upon examining cadavers of addicts with a long history of intravenous heroin use, we found a number of macroscopic and microscopic morphologic pathological changes in the liver. Their characteristics, localization and severity depend on a number of key factors – the period of intravenous use of heroin; adhering to the main principles of aseptic treatment, such as using disposable needles, whether one or more people used the same needle, and the purity of and other substances in street heroin.

Key words: morphological changes, liver, heroin

Introduction:

With the progress made in the fields of chemistry and chemotherapy, a whole series of synthetic substances have come to fill the specter of drugs with such pharmaceutical properties. Misuse or abuse of these substances, referred to as "drugs", has created a major problem for society, namely drug addiction.

Medical texts contain descriptions of various morphological changes to different organs and tissues, related to and resulting from prolonged intravenous heroin use. These include different skin, cardiovascular, lung, liver, kidney and other morphological changes resulting from both the direct toxic impact of the drug and the way the dose is prepared, whether basic hygiene is maintained, and the type and amount of other substances present in the street dose. Morphological pathological changes within various organs include:

The pathogenesis of heroin-associated pathology is unknown, but the following factors are believed to play a role: the antigenic role of heroin and/or substances found

in it [6]; acute and chronic infections [1] and the related immune complex [2,6] or chronic hepatitis B and C with extrahepatic manifestations, direct damage from hepatitis and HIV to the glomerular structures with development of immune complex glomerulonephritis or HIV-associated nephropathy [1, 2]; unwanted side effects from interferon treatment of drug addicts with chronic viral hepatitis (appearance of autoimmune phenomena, provoking or exacerbating a preexisting autoimmune disease, thrombotic microangiopathy, tubulointerstitial nephritis, glomerulonephritis, acute renal failure). Acute and chronic forms of hepatitis are results from different types of viruses. Hepatitis C is the primary form of chronic hepatitis found in intravenous heroin addicts, which may develop into cirrhosis, liver failure and hepatocellular carcinoma [9].

The aim of our study was to establish morphological changes into liver of heroin addicts, who died following long-term intravenous use.

Material and methods

We studied 25 patients (16 men and 9 women), who died following long-term intravenous heroin use (between 8 and 106 months), at the Centers of forensic medicine and Clinical pathology of Alexandrovska University Hospital between 2007 and 2011. We traced the macro- and microscopic morphological changes to liver – to determine their type and the damage of the toxic substance to the body. We used light-microscopic study with Hematoxylin-eosin and PAS reaction. Thin slices were made (5 μ m).

Results

In every case we studied, we found focal inflammatory changes to the skin and subcutaneous tissue in the areas where injections of the drug are most common (cubitals, groins, knee pits, forearms, thighs, legs).

In every case we found liver damage to various degrees. Lipid dystrophy was the most common morphological change to the liver, stemming from long-term heroin use. Less frequently, we found hepatitis of toxic genesis without fibrosis changes to the liver parenchyma (cirrhosis). The histological changes with such toxic liver damage are shown by means of vacuolization in the cytoplasm of the hepatocytes (fatty liver dystrophy, figs. 1, 2), inflammatory infiltration of mononuclear cells and leucocytes with nuclear segmentation in the portal spaces of the liver (toxic hepatitis, figs. 3, 4). No morphological changes to the bile ducts were observed.

Discussion

Some authors [3, 7, 8] believe that the morphological pathological changes to multiple organs result from changes in the immune system, which are in turn due to the impact of painkiller drugs on the Humoral Immune Response and cell-mediated immunity. The direct effect of analgesic drugs on the immune system is lower resistance of the body to specific and non-specific infections, which is one of the main causes of morphological changes to the organs observed both during treatment of patients and upon examining the cadavers of long-term heroin addicts.

Chronic infections are believed to play a pathogenic role. Patients who inject cocaine and heroin under the skin develop nephrotic syndrome with increase of serum creatinine and creatinine clearance [8]. Hepatitis antibodies were found in the serum in 15

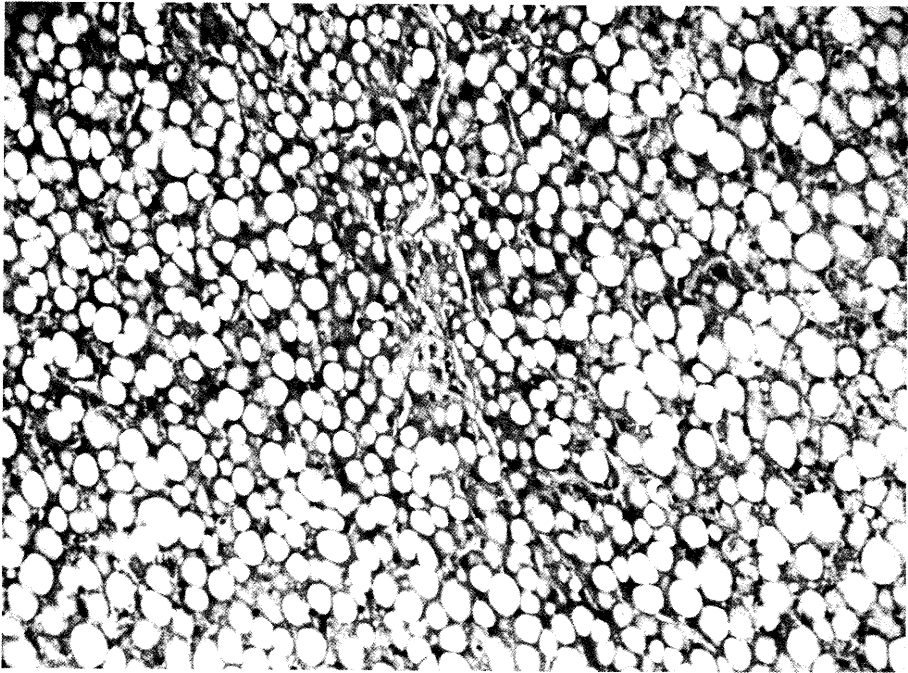


Fig. 1. Vacuolization in the cytoplasm of the hepatocytes (fatty liver dystrophy). HE, (x100)

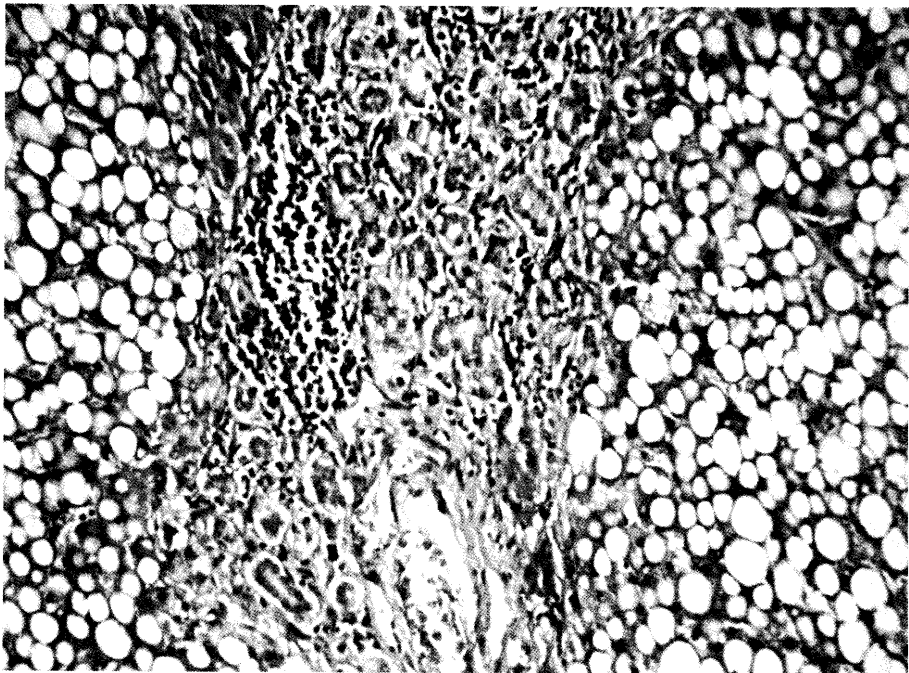


Fig. 2. Vacuolization in the cytoplasm of the hepatocytes (fatty liver dystrophy). HE, (x100).

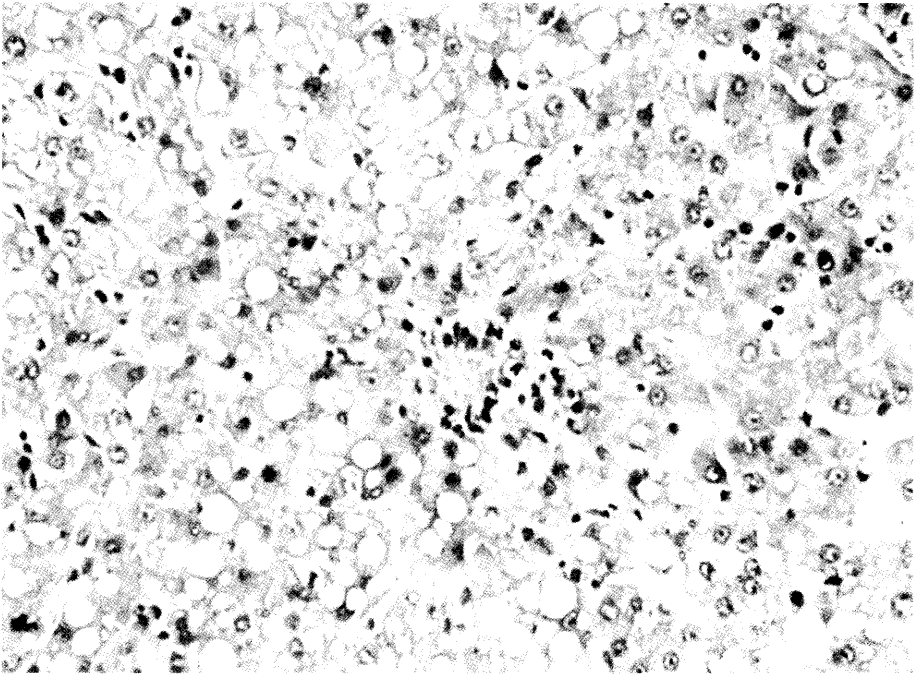


Fig. 3. Inflammatory infiltration of mononuclear cells and leucocytes with nuclear segmentation in the portal spaces of the liver (toxic hepatitis). PAS. (x200).

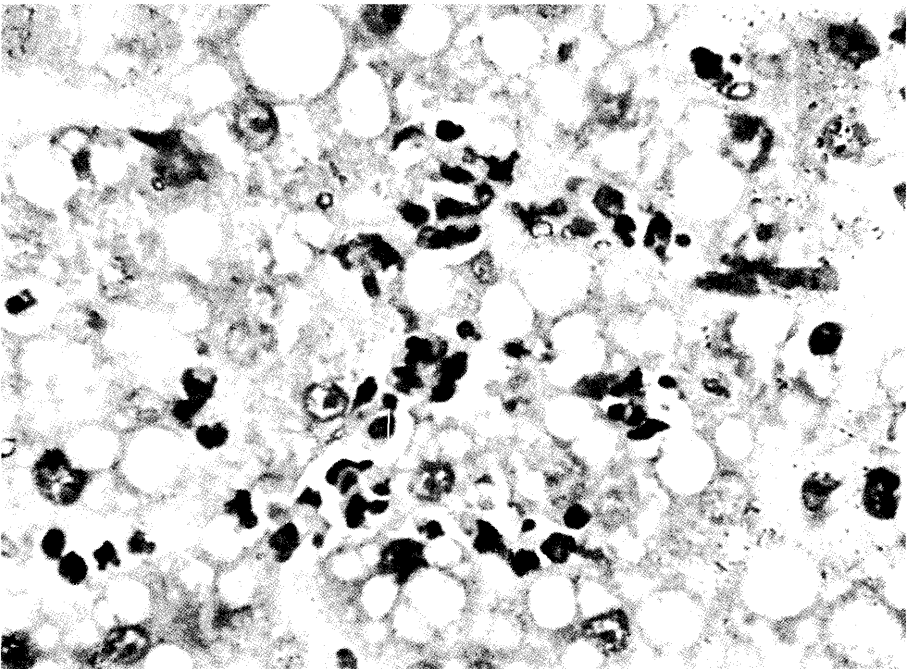


Fig. 4. Inflammatory infiltration of mononuclear cells and leucocytes with nuclear segmentation in the portal spaces of the liver (toxic hepatitis). PAS. (x400)

cases, while three of all patients were HIV-positive. Chronic hepatitis B and C are known to be connected to glomerulonephritis. Drug addicts in Europe develop monolymphocytic membrane-proliferative glomerulonephritis, in part due to heroin use or to the other substances mixed in with the drug and obviously independent of the hepatitis infection [2]. We must point out that these patients were not tested for hepatitis and HIV, which makes it possible to attribute the morphological changes to the kidneys and liver to these viruses. That aside, fatty liver dystrophy, which was observed in every case we studied, is usually caused by toxic substances. The combination of lipid dystrophy and inflammatory infiltration from mononuclear leucocytes and leucocytes with nuclear segmentation in the portal spaces of the liver could also be a morphological result of liver damage from toxic substances. The immunosuppressive effect of heroin is well known, which explains the specific and non-specific inflammatory changes observed in the lungs of deceased heroin addicts. It appears that prolonged abuse of "street" heroin is the most frequent cause of severe immunodeficiency along with HIV. This makes the user vulnerable to pneumocystic pneumonia, which is sometimes the direct cause of death. Opiate-induced asthma and other conditions provoked by drug abuse can make death more likely to occur [5]. Other authors describe the case of an HIV-positive intravenous addict with diffuse thrombosis of the superficial veins all over the body and periphlebitis with perivascular abscesses, who injected cocaine and heroin into his neck veins. He also suffered from oral candidiasis, Hepatitis C, bronchopneumonia, endocarditis and tricuspid valve insufficiency [4].

Conclusion

As the evidence shows, the most common "hard" drug – heroin – causes morphological changes and damage of varying intensity and clinical significance to different tissues and organs in the body when injected over a long period of time. Possessing knowledge of the morphological substrate of these changes enables experts of forensic medicine and pathoanatomy to give a quick and correct diagnosis of cases in their practice, thereby assisting clinicians, law enforcement officials and investigators.

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