The aim of this study was to evaluate the histopathological and apoptotic changes occurring in the rat ipsilateral and contralateral testes, after experimental spermatic cord torsion, and to explore the role of poly(ADP-ribose) polymerase (PARP) cleavage in testicular torsion-detorsion injury. A total of 37 Wistar albino rats were subjected to 720 degrees unilateral spermatic cord torsion for 1, 2 and 4 h, followed by 4-h reperfusion, or else to a sham operation (control group). Histology of the testicle was evaluated using haematoxylin-eosin (H&E) staining and Johnsen's scoring system. Germ cell apoptosis was evaluated via active caspase-3 immunostaining, and PARP expression levels were evaluated via Western blotting. The mean Johnsen's tubular biopsy scores (JTBS) of the ipsilateral testicles were lower for all torsion groups than for the controls (P < 0.05), but the JTBS of the contralateral testicles were only lower in the 4-h torsion group (P < 0.05). The mean apoptosis score (AS) of the ipsilateral and contralateral testicles was significantly higher in the torsion groups than in the sham group. AS increased correlatively with torsion time, in both testicles. The effect of testicular torsion on PARP cleavage was time dependent, with the highest effect observed after 4 h of testicular torsion (P < 0.05). Testicular torsion caused time-dependent histological changes, apoptosis and increases in PARP cleavage. Our results suggest that testicular torsion-detorsion injury caused cell damage and germ cell apoptosis that apparently involved cleavage of PARP. Increased PARP cleavage could, in turn, lead to enhanced apoptosis.