

K-05

Nd:YAG interstitial laser coagulation in vivo: Histopathologic analysis of the renal parenchyma in different times after effect

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- **Purpose:** To research the correlation between Nd:YAG output power, exposure time, and changes of a renal parenchyma in order to determine the best results of interstitial laser coagulation with the lowest possibility of complication.

- **Methodology:** A Nd:YAG laser, in free-running mode, was utilized to deliver a beam through bare fibers of the kidneys of 8 dogs and 6 rabbits. The laser operated at the output power of 18-41W, with the exposure time of 1-20s. Histopathologic analysis of the lesions was performed, which included macroscopic analysis and histologic data. Histologic data were recorded for the following variables: depth, weight of lesion, and the presence of viable cells in the area subjected to coagulation. The distributions of variables were examined immediately after the interstitial laser coagulation (ILK), on the third, seventh and fourteenth day.

- **Results:** Immediately after the effect, the region of coagulation contained a narrow canal with dry necrosis. Instantly after the coagulation the area of excretory tubules developed necrosis, 3-4mm in width and 14mm in depth. Swelling and destruction of collagen fiber were recorded in this zone. On the third day the canal reparation began, with the necrosis area growing to the width of 8mm and the depth of 17mm. The changes in tissue around the necrosis area were recorded as swelling, blood stroke, neutrophil's infiltration, and growing blood vessels. In 7-14 days the coagulation zone was 9mm in width and 14mm in depth, with the total necrosis of excretory tubules and fibroblast formation. Local and widespread infiltrations of neutrophils and leukocytes, as well as growing blood vessels were observed in the surrounding tissue. The results indicated that the laser radiation produced tissue necrosis with forming a small cavity immediately after effect. The size of the necrosis area depended on the output power and the exposure time. This necrosis area was named "the elementary volume of coagulation".

- **Conclusion:** A single-time laser exposure can be used in coagulation for only a small fraction of tissue. In this case necrosis area was called "the elementary volume of coagulation". It is recommended to use these results for ILC of localized kidney tumors.