# INTRODUCTION

It is well established that the kidney plays an important role on regulation of the internal environment. It is likewise the only one route of elimination of the waste products resulting from the cellular metabolism. Some of these waste products are the toxic substances and become highly injurious if it allows to be accumulated. The constancy of the internal environment is largely the result of continuous exchange of materials between blood and tissues.

The complex biochemical reactions occur in the kidney. However, it will not withstand loss of its blood supply and can not tolerate to the accompanying anoxia for any great length of time without possible impairment of some of its functions. Therefore, there has been increasing in the experimental studies in recent years for clinical applications such as partial nephrectomy and renal transplantation. A feature of these operations is the interruption of the blood flow to the kidney for varying inte rvals. It is necessary to consider the effects of temporary ischemia on subsequent renal functions because a suitable length of time would be necessary for the operative procedure. Many workers have sought means for preserving full renal function despite prolongation of the permissible ischemic times. In general, special operative techniques will never become generally accepted unless they are safe, effecient and, to a large extent, relatively simple. Whole body hypothermia seems to be an unnecessary complicated way to achieve renal cooloing and some hazards may be associated. Intravas-

cular perfusion, involving disturbance of the renal vasculature, may be more appropriated for transplantation. The perfusion of a perfusate into the kidney is a more complication and may produce undesirable effects.

The purpose of the present study is to ascertain the effect of renal hypothermia and renal compensatory adaptation in dogs. The first series of the experiments is concerned with the idea that if the cells of the kidney can be induced into a state of temporary cooling, the biochemical disturbances which are produced by anoxia, may be reduced. This will allow the surgeon much longer time for performing the operation of the kidney. The renal hypothermia may also be carried out to much lower and effective temperature than in total body hypothermia. Therefore, the present study was performed to investigate a simple technique of local renal cooling which the blood supply of the kidney was arrested for a period of time.

The second series of the experiments deals with the functional response of the remaining kidney after elimination of one kidney. It has been known that when one of the kidneys of an animal is surgically removed or not functional properly, its partner undergoes increasing both in mass and function. Although a great deal of work has been done on compensatory changes following unilateral nephrectomy, the causes and mechanisms of the compensatory response are not fully investigated. The present investigation was performed to observed the renal function during the 2-hour period following elimination of one

kidney. This may give the informations about the onset and mechanism of compensatory response which has been widely controverted.

The results of the experiments in renal hypothermic group as comparison with those in renal normothermic group showed the protective effect of renal hypothermia during renal ischemia. Renal functions reflected by RPF, RBF, GFR and urine flow rate in renal normothermic group significantly decreased to the exceeding low levels. These functions were significantly improved when renal hypothermia was applied simultaneously. However, further investigation in the field of local renal hypothermia is necessary in order to determine the critical temperature for prevention of tissue injury from ischemia and how these observations may be applied clinically.

In renal compensation group, the results were shown that acute functional elimination of one kidney for 2 hours did not affect all parameters except one of the functional status of the remaining kidney. The constancies of GFR, solutes and water excretions, potassium excretion and urine output were observed. The only one renal function changed markedly was the ability of the kidney to excrete hydrogen ions. The results reveal that acidification of urine may be the first compensatory event of the remaining kidney after elimination of one kidney. The exact mechanism by which renal acidifying activity is enhanced should be further investigated.