SHORT COMMUNICATION

TOWARDS SUBSTANTIATION OF INTACT NEPHRON HYPOTHESIS

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Summary: A prolonged study on sheep and goats; whose 83% of total renal mass was removed, revealed that even an extremely heterogenous kidney not only performed the regular function but remained responsive for the demands of the body.

Key words: intact nephron hypothesis

INTRODUCTION

While studying the effect of experimental maternal renal insufficiency on the fetus of sheep and goat certain observations were made with regards to kidney function during pregnancy and non-pregnancy. These observations are presented herewith.

MATERIALS AND METHODS

This study included sub-total nephrectomy (removal of about 83% of total renal mass) in 10 sheep and 9 goats of which 7 sheep and 3 goats had an advanced pregnancy of about 120 days. Four sheep and 4 goats died in a period of 2-34 weeks following operation while others continued to survive upto 52 weeks without any clinical symptoms when they were sacrificed. During this period they parturated twice. Firstly about a month following operation giving birth to 8 lambs and 2 kids and secondly about 12 months following operation producing 6 lambs and 2 kids. Blood urea nitrogen was estimated by microdiffusion technique while tissues were processed by routine paraffin sectioning.

RESULTS AND DISCUSSION

Immediately following operation BUN values in these animals were about 8 times the normal (9 mg%) by 7 weeks these stabilised at about 5 times the normal which persisted throughout except a hypobolic deviation before, during, and after pregnancy.

Histopathologic studies of the kidney revealed nephrosclerotic changes providing an overall view of an 'end stage' kidney (Fig. 1). These could be the result of peculiarity of
kidney's blood supply (1), increased accommodation of blood following nephrectomy (2), renal autoregulation of glomerular filtration rate (3), associated compensatory hypertrophy (4), and/or hypertension following reduced renal mass (5).

Similarity of lesions amongst pregnant as well as nonpregnant sheep and goats suggested that in these experiments the pregnancy did not deteriorate the renal function to the extent of failure. Such a finding was not expected since during pregnancy, which is a physiological stress, the subclinical renal insufficiency was expected to be manifested. The validity of the statement that the kidney was subjected to great stress might be obvious by the fact that in the pregnant animals increased renal blood supply was far more (about double) than even in uterus (6). Again the work of Sims (7) has established renal hyperfunction during pregnancy. In the face of aforesaid facts, it is surprising that such an increased blood flow as well as forced kidney hyperfunction did not advance or deteriorate an insufficiency (in advanced pregnancy) which was achieved by removal of almost 83% or renal mass. This substantiated the intact nephron hypothesis of Bricker et al. (8) which emphasized that even an extremely heterogenous (structurally) kidney not only performed the regular function but remained responsive for the demands of the body.

Fig. 1: Photomicrographs (HE, 42X) kidney from a subtotal nephrectomised sheep showing an 'end stage' with considerably reduced number of glomeruli some which appear as cystic spaces while others appear considerably enlarged.
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following nephrectomy (2),
induced compensatory hypertrophy

that such an increase or deterioration can be expected to be manifested.


REFERENCES


