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STUDY OF THE TRANSMIGRATION OF FLUID
RAPIDLY INFUSED INTO DOGS
WITH RENAL BLOOD VESSEL LIGATION AND
INCREASED PULMONARY CAPILLARY PERMEABILITY

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To study the transmigration of fluid rapidly infused intravenously, large volumes of lactated-Ringer's solution (90ml/kg/hr, for 30min) were infused into generally anesthetized dogs. Four groups were made: group C (as control), group F (with rapid fluid infusion only), group LF (with renal blood vessel ligation and rapid fluid infusion), and group OF (with increased pulmonary capillary permeability induced by oleic-acid and rapid fluid infusion). Extravascular lung water volume (ELWV) was measured using the thermal-sodium double-indicator dilution method and cardiac output, the amounts of ascites (AA) and urine (AU), specific gravity of urine (SGU), hematocrit (Ht), and plasma total protein (TP) were also measured at intervals after the beginning of rapid fluid infusion. The results were as follows:

1. In group F, ELWV increased significantly but not to a level high enough to pose clinical problems, and gradually returned to the level before rapid fluid infusion. AU increased distinctly during the infusion while AA increased significantly, especially after the infusion. This suggested that most of the excessive fluid was excreted as urine. SGU, Ht, and TP decreased significantly during rapid fluid infusion.
2. In group LF, the change in ELWV was almost the same as in group F. AA distinctly increased after the beginning of rapid fluid infusion and excessive fluid was mainly excreted by gradual transudation into the abdominal cavity. Ht and TP decreased most in all groups.
3. In group OF, ELWV rapidly and distinctly increased immediately after the beginning of rapid infusion and remained high until the end of this examination. On the other hand, AA and AU did not distinctly increase more than in group F or LF but the increase was sometimes statistically significant. This suggested that most of the excessive fluid mainly excreted from blood vessels by transudation into the pulmonary interstitium. Ht and TP decreased with statistical significance but not more than in group F or LF. SGU changed little. Arterial blood gases grew distinctly worse only in this group.

These results show that in the dogs with only fluid overload (F, LF) excessive fluids are mainly excreted as urine and next as ascities and that they do not generally transude into the pulmonary interstitium. However, in dogs with increased pulmonary capillary permeability (OF), excessive fluid easily and rapidly transudes into the pulmonary interstitium and causes pulmonary edema.