

Simplified Technic for Partial Hepatectomy in Rats with Fatty Livers.* (18719)

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In the course of experiments on rats on high fat diets, a technic for partial hepatectomy was developed which has not been previously described. This procedure, even when applied to rats on high fat diets, has resulted in a low operative mortality, minor post operative infections and has avoided the complication of the rat's chewing at the wound. In place of an abdominal incision as used by other investigators(1,2,3,4), the incision is made dorsally. Following the skin incision, an incision is made to the left of the spinal column along the lateral edge of the lumbar muscle. This incision is widened by expanding the scissors in the incision, and then extending the incision along the margin of the ribs for a short distance. A small, curved artery clamp is placed on the muscle at the upper corner of the incision and by pressing on the abdomen, the liver can be delivered through the incision. Using a piece of gauze, the left lobe of the liver is drawn out and then the median lobe. At this point, by exerting pressure on the clamp holding the upper corner of the wound, there is adequate space for placing a clamp around the two lobes of the liver. A coarse linen tie is placed behind the clamp and the lobes of the liver are excised. The remaining liver lobes are permitted to drop back into the abdomen. The muscle is closed with interrupted sutures and then the skin is closed. The operation requires no more than 10 minutes. There is a minimum of bleeding. The animals are unable to reach the wound and only minor post

TABLE I. % Composition of Diet.

	Diet C ₂ %
Hydrogenated cotton seed oil	36
Cod liver oil	2
Casein	10
Sucrose	47
Salt mixture	5

Diet was supplemented as follows in mg/100 g diet: Thiamine 1 mg, pyridoxine 1 mg, riboflavin 2 mg, pteroylglutamic acid .2 mg, biotin .05 mg, Ca pantothenate 1 mg, niacin 10 mg, mixed tocopherols 15 mg, "synkavit" (2-methylnaphthohydroquinone 1,4-tetra-sodium diphosphate) 15 mg. Composition of salt mixture in %: ferric citrate 2.3, Ca diphosphate 44, K citrate 42, Mg citrate 11.6, Cu sulfate .08, K iodide .01%. Drinking water: 1% NaCl.

operative complications are encountered. The procedures are illustrated in Fig. 1.

The diet used in these experiments is shown in Table I. This type of high fat and low protein diet results in fatty infiltration of the liver varying in degree from one animal to another. The weights of the individual liver lobes were determined after 62 days on the diet and, are shown in Table II. The weights of the lobes of the livers of normal male rats from our rat colony (Long-Evans strain) are also given for comparison. The weights of the liver lobes of normal rats, as % of total liver weight, agree closely with values reported by other observers(2,4), although liver weight as % of body weight is somewhat greater in our rats. In spite of the increase in the weight of the liver lobes, due to fatty infiltration, the relationship of the lobes to one another did not differ from that of normal rats. The liver removed by partial hepatectomy in our experiments therefore represents $71.3 \pm 2.9\%$ of the total liver. In an occasional rat, the median lobe consisted of 3 rather than 2 parts, and when this occurred the weight of the median lobe amounted to about 50% of the total weight of the liver.

The hepatectomies were done on male rats that had been on a high fat diet for 42 to 62

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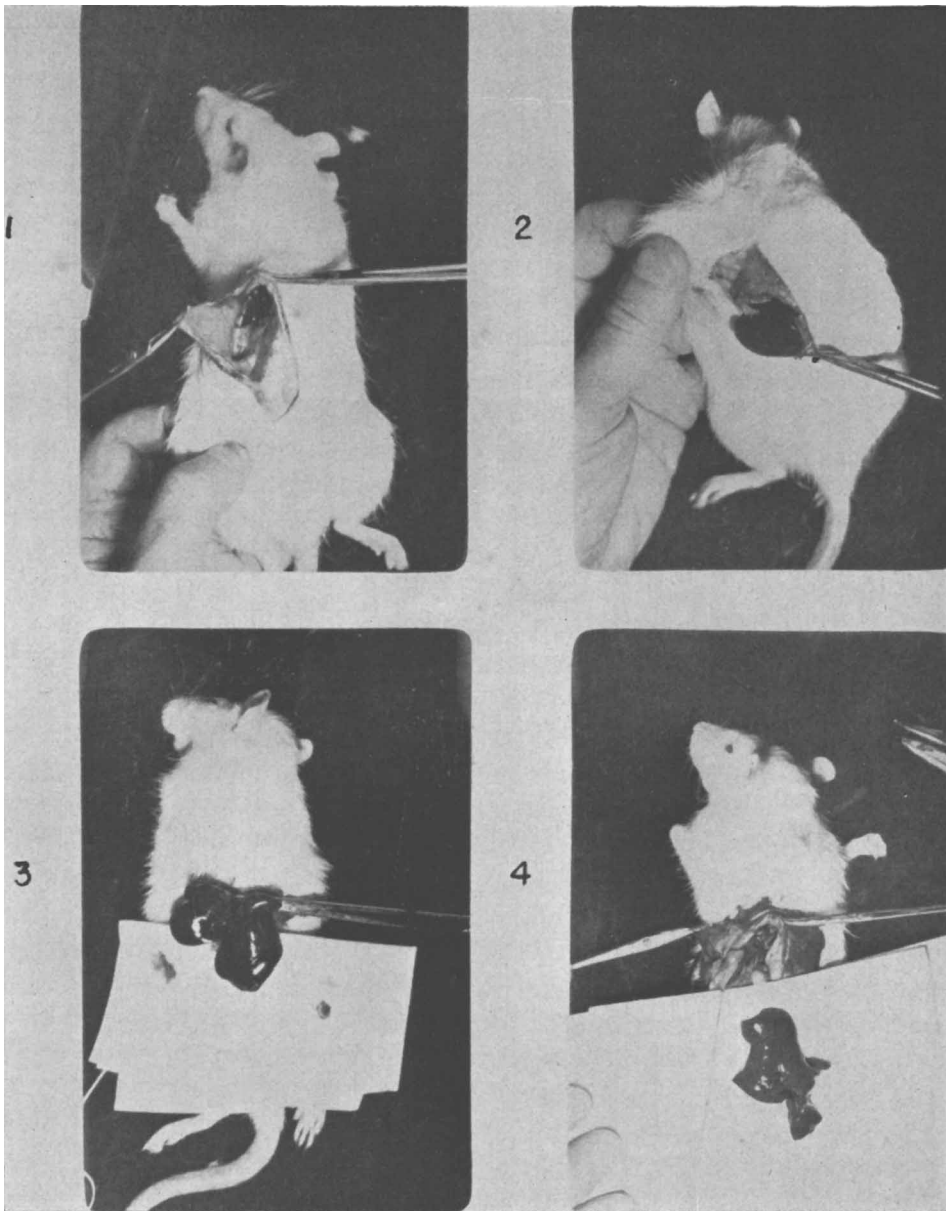


FIG. 1
Technic for partial hepatectomy in the rat.

days, which meant that the liver, at operation, was fatty, large, and more readily traumatized than the normal liver. In spite of this, the immediate operative mortality was fairly low, averaging 24% of a total of 89 rats during the first year of these experiments and 4% of a total of 25 rats during the second year. Post-operative care consisted of the administration of aqueous penicillin and 20%

glucose in 1% NaCl as drinking water during the first 24 hours. Other observers(2,3) have reported a surgical mortality of about 5% following partial hepatectomies by the abdominal route in rats on normal diets, while rats on a 13% fat diet were reported *not* to survive this operation(3).

This procedure has enabled us to obtain chemical data on the liver of a rat at the time

TABLE II. Relation of Weight of Liver Lobes to Total Liver Weight.

	10 normal rats			10 rats on high fat diet		
	Range	Mean	Stand. Error	Range	Mean	Stand. Error
Wt of rats—g	150-250	200	± 3.02	118-207	170	± 8.20
Wt of liver—g	6.38-9.53	7.77	$\pm .30$	6.32-15.86	9.63	$\pm .93$
Liver wt as % of body wt	3.08-4.61	3.92	$\pm .16$	3.31-9.60	5.76	$\pm .59$
Wt of liver lobes—g						
Left lateral	1.84-3.35	2.61	± 1.58	2.44-5.60	3.31	$\pm .29$
Median	2.22-3.34	2.76	$\pm .13$	2.00-7.16	3.58	$\pm .48$
Right lateral & caudate	1.20-3.10	2.40	$\pm .16$	1.55-4.92	2.74	$\pm .30$
Wt of liver lobes as % of total liver wt						
Left lateral	26.2-39.5	33.45	± 1.19	28.8-38.6	34.73	± 0.83
Median	32.0-52.3	35.77	± 1.98	31.6-54.0	36.61	± 2.09
Right lateral & caudate	18.9-34.8	30.77	± 1.54	17.2-33.5	28.66	± 1.59

of operation, and again at the time the animal was sacrificed. We have found that the total lipid content of the liver of rats which had been on the high fat diet for 42 to 62 days varied considerably. The range in a series of 41 animals was from 4 to 23 g%. In view of the wide variation in the lipid content of the liver, the opportunity of having each rat act as its own control is advantageous.

Summary. A method is described for partial

hepatectomy in the rat which is applicable to animals with fatty livers. It was found that in rats with enlarged livers, due to fatty infiltration, the relation of the weights of the various lobes to one another and to the total liver weight was similar to that in normal rats. Apparently, the individual lobes maintain their relationship in spite of fatty infiltration.

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