

Effect of Vagotomy on the Conjugated Bile Acids in the Dog

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(Received on March 28, 1980)

C. VAQUERO-PUERTA, J. M. VAZQUEZ-GALLEGO and P. GOMEZ-BOSQUE. *Effect of Vagotomy on the Conjugated Bile Acids in the Dog*. Rev. esp. Fisiol., 37, 443-446. 1981.

The effects of truncal vagotomy and selective gastric vagotomy on the conjugated bile acids and ratios T/G and Tri/Di have been studied in twenty dogs.

The results show that truncal vagotomy has no effect on the conjugated bile acid values determined in the 4th and 16th week. The ratio T/G increased while the Tri/Di decreased in the 16th week. The selective gastric vagotomy only shows a change of the taurocholic acid levels which are lower than the control levels in the 4th week.

In the last few years several papers have been published on the undesirable effects of vagus nerves section in the surgical treatment of peptic ulcers. The possibility of cholelithiasis and other disfunctions on the biliary system after surgical operation has been indicated in experiments with animals (2, 12) and in clinical experience (5, 18); many authors have found changes in concentrations of cholesterol, phospholipids, total and unconjugated bile acids (15, 22, 23, 25, 26).

However, the effects of both the selective gastric and the truncal vagotomy on the conjugated bile acids on one hand the ratios of conjugated taurine to conjugated glycine (T/G) and trihydroxiacids to dihydroxiacids (Tri-Di) on the other hand have not been studied yet.

Materials and Methods

Twenty adult mongrel dogs, weighing between 18 and 25 kg and maintained on a standard diet, were used. They were anesthetized and a tracheal tube was inserted and connected to a respirator. After that, the gallbladder was cannulated with a Pezzer tube (n° 20). Four weeks later the bilis was obtained by aspiration through the Pezzer tube and concentrations of bile acids, taurocholic (TC), glycocholic (GC), taurodeoxycholic (TDC), taurochenodeoxycholic (TCDC), glycodeoxycholic (GDC) and glycochenodeoxycholic (GCDC), were established. These values were taken as a control. Subsequently, the dogs were divided into two groups of ten dogs each. Twenty four

hours later they were re-anesthetized to make a truncal vagotomy (8) in one group and a selective gastric vagotomy (14) in the other; moreover a pyloromyotomy (17) was made in both to facilitate the gastric drainage. The values of conjugated bile acids were obtained 4 weeks and 16 weeks later. When the experiment was completed, the dogs were sacrificed. At autopsy, the correct surgical section of nerves was verified. In each bile sample the bile acids were isolated by the FOLCH *et al.* (13) method, and the conjugated bile acids were separated and analyzed by thin layer chromatography (6). The ratios of conjugated taurine to conjugated glycine (T/G) and the ratio trihydroxiacids

to dihydroxiacids (Tri/Di) were established. These values and their significance were analyzed by t-test.

Results

The results are shown on tables I and II.

Both the conjugated bile acids values and the ratios T/G and Tri/Di obtained after *truncal vagotomy* do not differ statistically from those of the control animals in the 4th week. Also the differences in the conjugated bile acids levels were not significant in the 16th week. However, at this time after the operation the T/G coefficient of the experimental animals was significantly greater than the control one,

Table I. *Changes in conjugated bile acids (mM/l) and ratios T/G and Tri/Di after truncal vagotomy.*

	Control	4th week			16th week
<i>Bile acids</i>					
T C	3.53 ± 0.47	3.48 ± 0.27	N.S.	3.51 ± 0.36	N.S.
TDC + TCDC	3.98 ± 0.58	4.10 ± 0.75	N.S.	4.50 ± 0.44	N.S.
G C	11.98 ± 1.39	12.28 ± 0.97	N.S.	10.89 ± 1.25	N.S.
GDC + GCDC	23.38 ± 1.41	23.76 ± 1.15	N.S.	24.32 ± 0.91	N.S.
<i>Ratios</i>					
T/G	0.20 ± 0.02	0.20 ± 0.01	N.S.	0.22 ± 0.02	p < 0.05
Tri/Di	0.56 ± 0.05	0.56 ± 0.03	N.S.	0.49 ± 0.04	p < 0.01

N.S. = differences not statistically significant.

Table II. *Changes in conjugated bile acids (mM/l) and ratios T/G and Tri/Di after selective gastric vagotomy.*

	Control	4th week		16th week	
<i>Bile acids</i>					
T C	3.53 ± 0.47	3.10 ± 0.37	p<0.01	3.89 ± 0.24	N.S.
TDC + TCDC	3.98 ± 0.58	4.30 ± 0.75	N.S.	4.21 ± 0.45	N.S.
G C	11.89 ± 1.39	12.13 ± 1.84	N.S.	11.96 ± 0.73	N.S.
GDC + GCDC	23.38 ± 1.41	22.97 ± 1.53	N.S.	22.99 ± 1.07	N.S.
<i>Ratios</i>					
T/G	0.20 ± 0.02	0.20 ± 0.03	N.S.	0.22 ± 0.05	N.S.
Tri/DI	0.56 ± 0.05	0.54 ± 0.05	N.S.	0.57 ± 0.05	N.S.

N.S. = differences not statistically significant.

and the Tri/Di coefficient was significantly lower in the experimental than in the control animals.

The *selective gastric vagotomy* has no effect on the conjugated bile acids except to decrease the taurocholic acid levels in the 4th operation ($p < 0.01$). The vagus nerve section had not produced effects on the ratios T/G and Tri/Di.

Discussion

Our results show alterations on the ratios T/G and Tri-Di after truncal vagotomy. Different factors are involved in this problem. The effect of dietary elements has been pointed out by some authors (10-12), but this factor will not be considered in our research, since both the experimental and control dogs were fed the same diet. On the other hand MURPHY (16) has reported that hepatic diseases may produce alterations in the ratio T/G, probably in relation to disfunction in hepatic cells. However from our results it is not possible to infer a definite relationship between vagotomy and hepatic cell disfunction. In other works (7, 10, 19) a relationship between ileal disorders and the values of the ration T/G has been reported but the relation between truncal vagotomy and ileal disorders, though possible, is not well established at present (9). The processes of intestinal absorption are involved in the changes of the ratio Tri/Di. The absorption levels are modified by troubles in the intestinal absorptive mechanism and several authors consider the possibility that truncal vagotomy may produce these troubles (3, 4, 20, 21, 24). Decreases in the ratio Tri/Di after truncal vagotomy were also found by KOMAKI (15). They are possibly connected with the cholelithiasis developed after such operation, reported by ARNESJO *et al.* (1). In these patients the ratio Tri/Di also decreased.

Acknowledgements

We are greatly indebted to Mr. C. INÍGUEZ LOBETO for his excellent technical assistance.

Resumen

Se estudia en perro los efectos de la vagotomía troncular y de la vagotomía selectiva gástrica sobre los ácidos biliares conjugados y los cocientes T/G y Tri/Di. La vagotomía troncular altera significativamente los cocientes T/G y Tri/Di a las 16 semanas después de la operación, mientras que la vagotomía selectiva gástrica altera los valores del ácido taurocólico a la 4.^a semana.

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