ABSTRACT

Introduction – The function of the ileocaecal valve still remains controversial, especially the importance of preservation of the valve during right hemicolectomy. This research was carried-out with an objective to study manometric characteristics combined with videography and the neuronal density to assess the capability of this structure to function as a sphincter. A detailed study of the arterial supply of the ileocaecal region was also done with a view of exploring the possibility of a modified right-hemicolectomy with a preserved ileocaecal valve with adequate arterial blood supply to the anastomosis.

Patients and Method – The ganglion density of the ileocaecal region was studied in 73 cadavers within 12 hours of death using haematoxylin and eosin staining.

The manometry of the ileocaecal region was studied using a water-filled balloon catheter in twenty-one individuals who underwent colonoscopy. Mean intra-luminal pressure (area under the curve/ duration) was also measured during this procedure. Further more, valve videography was performed in thirteen individuals.

Fifty-four fresh human cadavers were studied with informed written consent from relatives. In this study, 20cm of terminal ileum with the ileocaecal segment and approximately 20cm of ascending colon were removed en-block with its mesentery and blood supply. The ileocolic artery was cannulated and injected with 10ml of water-soluble red-dye under pressure. The arterial supply was dissected to demonstrate a pattern.

Results –

Study on density of the ganglia of myenteric plexus in the ileocaecal region

Of 73 specimens studied, the ileocaecal valve had the highest number of ganglions found in one mm^2 of area (mean 0.491 ganglions/mm^2; SD 0.283). The terminal

ileum had a mean of 0.322 ganglions/mm^2; SD 0.209. The least number of ganglia was found in the caecal sections (mean 0.241 ganglions/mm^2; SD 0.166). These findings showed a statistically significant ($P<0.0001$) higher number of ganglions per mm^2 in the ileocaecal valve (ICV) than in the terminal ileum or caecum.

Study of the pressure gradient across the ileocaecal valve in normal adults

In twenty individuals (95%), the intra-ileal pressure exceeded the intra-caecal pressure {ileal pressure [mean 4018.77, S.D. 4386.51] Pa vs. caecal pressure [mean 1742.64, S.D 4537.54] Pa}, $P<0.001$. Ante-grade pressure gradients were observed from terminal ileum to caecum in fifteen participants (71%). In five (24%), a high-pressure zone was observed within the ileocaecal valve. A reverse gradient was seen in one (5%).

Study of the ileocaecal valve cusp movements in live normal adults using video recordings during colonoscopy

Videography of the ileocaecal valve was analyzed in thirteen subjects for a total of 121 minutes (mean 9.3 minutes per subject). The valve orifice was observed to be at rest during alternating periods of contraction. Contractions of the valve cusps seemed to change the shape of its orifice. In 11 subjects, during the resting period of the valve, the orifice was semilunar and either closed or partially closed. These subjects had a longer and more curved superior cusp. The valve cusps were thickened in six subjects, while seven had narrow valve cusps. In all, 60 (mean – 5 per subject) active movements were observed in the ileocaecal valve cusps with 14 active caecal contractions. The frequency of active movements of the valve was 0.5 movements per minute. The ejection of effluent was observed on 49 occasions (mean – 4 ejections per

subject). Chyme was ejected in 15 instances and air in 34 instances. The ejection of effluent was always associated with active movements of the valve cusps. By contrast, some cusp movements were observed to be independent of the onward flow of effluent. Caecal wall contractions were found to be less frequent and were observed on 14 occasions.

Study of the arterial supply of the ileocaecal region

In fifty-six cadaveric specimens, the ICV was supplied by the ileocolic artery, a branch of the superior mesenteric, which divided into an anterior and a posterior caecal artery. A marginal branch of the right colic was noted to contribute to the ICV blood supply in only two (4%). Furthermore, study of the anastomosis at the ICV showed that the anterior caecal artery was present in all (100%), posterior caecal in 48(89%) and recurrent ileal artery present in fifty-three (98%).

A rich anastomosis between vessels at the ICV: small 'windows', short tributaries, was seen in thirty-eight (70%) whilst a poor anastomotic network at the ICV: large 'windows', long tributaries, between these vessels was seen in twelve (22%). In four (8%), we were unable to determine clearly between rich and poor anastomotic networks. Other variants included an absent posterior caecal artery in six (11%) and absent recurrent ileal artery in one (2%).

Conclusions – Manometry of the ileocaecal valve revealed a flap valve with an ante-grade pressure gradient in the majority. A reverse pressure gradient may explain valve incompetence. The ileocaecal valve had a predictable blood supply in the majority of patients. Preservation of the anterior caecal artery would ensure a vascularized ileocaecal valve in right hemicolectomy.