

ARTICLE

# Creation of a oblique colon valve: a new methods to wake up the stem cell of colon

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## Abstract

**Objective:** To find out a similar and better methods to increase colon absorptive function.

**Methods:** Oblique colon valves were created in colons of rats with the massive resection of the small bowels, and the rats were compared with group with traditional colon valves, and short bowel syndrome (SBS) group. The rats were observed for 30 weeks. **Results:** The rats in groups with colon valves were heavier than that in control group. And rats with oblique colon valves had less obstruction. **Conclusions:** Oblique colon valve was a better methods to increase the absorptive function of colon.

**Keywords:** a oblique colon valve; stem cell of colon; short bowel syndrome (SBS)

## 1. INTRODUCTION

Short bowel syndrome (SBS) was caused by loss of most part of small bowel. SBS patients should be treated by nutritionists, gastroenterologists and surgeons. Longitudinal intestinal lengthening and tailoring (LILT) [2], serial transverse enteroplasty (STEP) [3], segmental reversal of the small bowel [4] and iso-peristaltic colonic interposition [5] are the most common operations. Sequential lengthening procedures and controlled tissue expansion (CTE) may increase the absorptive area [6]. Distraction enterogenesis is another novel method to increase the absorptive area [7]. Intestinal transplantation is the last option for SBS patients [8]. After the massive resection of the small bowel, colon has absorptive function similar to that of the small intestine. To improve colonic absorptive function, the author made a valve on the rats' colon. The results showed that colon valve did enhance its absorptive function[8]. The study aims to find out a better to create a colon valve.

## 2. PROTOCOL

Eighty Sprague Dawley (SD) rats from Guangdong Medical Laboratory Animal Center were divided randomly into 3 groups. The weights of the rats in all the groups were not significantly different ( $P>0.5$ ). Group 1 was control group. The rats in group 2 had 80 percent of their small intestine and ileocaecal valves resected. The rats in group 3 had the same procedure like group 2 and having valves on the middle colon. The rats in group 4 had the same procedure like group 3 and the valve were oblique. No food or water was given to the rats from the day before the surgery. The rats were anaesthetized by the inhalation of halothane. In the procedure of creation of colon valve, eight interruptive sutures were placed on the sero-muscular layer. After tightening up the sutures, the colon wall between the two stitches was protruded towards the lumen. The sutures were repeated 8 times around the colon, a valve similar to the ileocaecal valve was formed. As for oblique colon valve, the valve was oblique to ease the passing of bowel content (Figure 1 and Video1). After 30 weeks, the rats were sacrificed with an intra-cardiac injection of 2 ml pentobarbital. The rats were cared for in accordance with the institutional guidelines of Guangdong Medical Laboratory Animal Center. The study was granted permission by the ethics committee of Guangzhou Women and Children Medical Center (registration number: 2017032302).

## 3. RESULTS

All rats in the control group and the SBS group and group 4 survived. 5 rats in group 3 died of obstruction. Thirty weeks later, the weight of the rats in the SBS group was much lighter than that of the rats in group 1, and weight of rats in group 3 and group 4 was heavier than that in group 2. There was no significant weight difference between the group 3 and group 4 (Table 1).

## 4. DISCUSSION

Short bowel syndrome (SBS) is caused by short small bowel that cannot adequately meet the requirements of the body. The surgical procedures used in these patients depends on their actual conditions. Longitudinal intestinal lengthening and tailoring (LILT) procedure [2] and serial transverse enteroplasty (STEP) are the two most common procedures [3], with similar results [4]. Iso-peristaltic colonic interposition [5] is used to slow the intestinal transit time. Sequential lengthening procedure can increase the absorptive area [6]. Distraction enterogenesis can increase the absorptive area [7] in animal experiments. Intestinal transplantation is a challenging operation for SBS patients [8]. The enhancement of the absorptive function of the residual bowel is another treatment method for SBS patients [9], [10]. Enabling the colon to have absorptive function similar to that of small bowel is another option. The colon in a small bowel environment shows some small bowel features [11]. Kono K [12] described a case in which an interposed colon had some form of small bowel features.

To enhance the colonic absorptive function, we shifted the ileocaecal valve from the cecum to the colon [8]. The transit time in the small and large bowel was longer. The rats with colon valves were heavier than those in the control group thirty weeks later. The histological examination showed that the colon before the valve was similar like small

intestine, including thicker mucosa, deeper crypts and fewer goblet cells. The  $\alpha$ -amylase and  $\text{Na}^+$ -dependent bile salt transporter levels in the colons before the valves were higher than those in the colons after the valves, showing that the colons before the valves more absorptive function [8].

However, some rats died of obstruction because of colon valves. We renewed the technique that the valve was changed to be oblique. So, the bowel content passed the valve easier, and the possibility of obstruction would be less. The outcome of the study showed that there was no case of obstruction in rats with oblique colon valves. The weight of rats with oblique colon valves had no significant difference between group3 and groups. The oblique colon valve had similar effect and less obstruction.

## 5. DISCLOSURES

The study was supported by Guangzhou technological program: The mechanism of stem cell regeneration through Wnt/-catenin pathway during epithelium metaplasia of the change from colon to intestine induced by colon valvoplasty. No:202102010196. Figure1.The

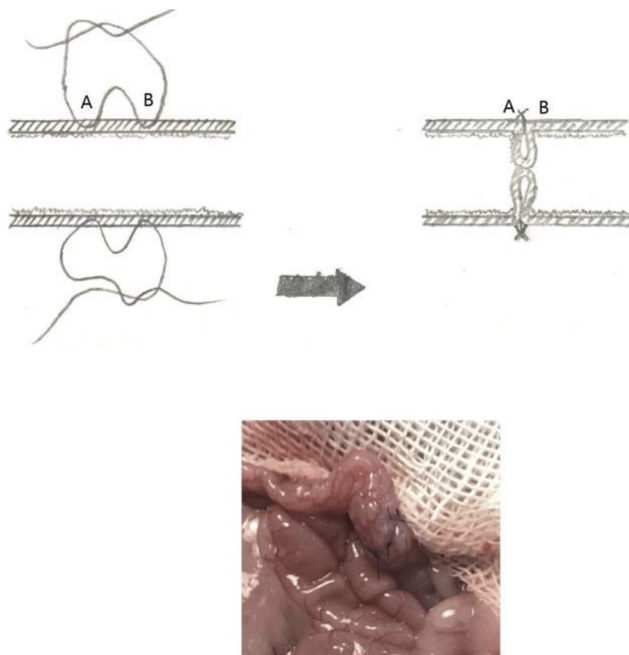


Figure 1

procedure of creation of colon valve.

Table1.The outcome of study.

Table 1. Outcome of the study				
group	transcription	die	weight.g	weight thirty weeks later.g
1	control	0	161±3.4	629±2.5
2	SBS rats	0	162±3.8	181±3.4
3	SBS rats that having colon valve	5	161±3.6	256±21
4	SBS rats that having oblique colon valve	0	159±4.5	260±15

Figure 2

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