

Research Note

## A New Therapy for *Taenia saginata* and *Diphyllobothrium latum* Infections by Duodenal Administration of Gastrografin

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Some effective drugs such as bithionol, paromomycin sulfate, niclosamide, quinacrine, mebendazole, praziquantel and kamala have been widely used for treatment of intestinal tapeworm infections (Yamakawa and Nagasaka, 1957; Yokogawa *et al.*, 1962; Nagahana *et al.*, 1966; Arambulo *et al.*, 1978; Rim *et al.*, 1979; Yoshida *et al.*, 1979 a, b; Suzuki and Otsuru, 1980; Chowdhari *et al.*, 1980; Veerannan, 1980; Yamamoto *et al.*, 1982). Most of these anthelmintics cause some damages to parasites and also side effects to patients. A cathartic should therefore be given to patients in order to discharge tapeworms and the drug administered. Moreover, these drugs sometimes destroy or tear off the scolex of a tapeworm and consequently the expulsive effect of the drugs administered may be misinterpreted. In *Taeniasis solium*, there remains a fear of autoinfection by eggs released from injured proglottids. Damaso de Rivas (1932) and Kihara *et al.* (1973) reported the use of duodenal administration of a large amount of warmed fluid to discharge intestinal tapeworms.

In the past two years, the authors successfully treated 4 cases of *Taeniasis saginata* and 2 cases of *Diphyllobothriasis latum* by duodenal administration of Gastrografin (Schering AG), a water-soluble contrast medium for the gastrointestinal canal (Committee of Radiol., Am. Acad. of Pediat., 1978). In this therapy, the descent of parasites in the intestinal lumen could be confirmed with X-ray fluoroscopy. No additional administration of cathartic was necessary and no serious side effect was noticed either during or after Gastrografin treatment. Although treated cases are still few, the authors are convinced that this method is a new effective therapy for intestinal tapeworm infections.

The procedure of Gastrografin treatment is shown below :

1) One day before Gastrografin treatment, 1 g of magnesium oxide, a laxative, is given to the patient twice, soon after supper and before sleeping.

2) On the day of treatment, the patient is made to fast until afternoon and laid on the bed for X-ray fluoroscopy. Then, a duodenal tube is inserted through the mouth until the tip reaches the transverse portion of the duodenum.

3) 100 to 200 ml of Gastrografin is introduced through the tube with a 50 ml syringe. The introduction is made at a speed of 15 to

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Table 1 Results of Gastrografin therapy

Species of tapeworm	Case number	Age and sex of patients	Complaints and symptoms	Discharge of proglottids	Abnormal findings (Eos. leuk. %*)
<i>Taenia saginata</i>					
	1	55 female	Perianal discomfort	+	none†) (3%)
	2	51 male	Discomfortable feeling	+	none (6%)
	3	48 male	Occasional abdominal pain Diarrhea	+	Slightly anemic (7%)
	4	44 male	Occasional diarrhea	+	none (2%)
<i>Diphyllobothrium latum</i>					
	5	39 male	Perianal discomfort Fatigue, Loss of appetite Diarrhea	+	Slightly anemic (1%)
	6	29 male	General fatigue	+	none (7%)

\* Percentage of eosinophile leukocytes in blood. † No particular findings in clin-administered. ‡ The scolex was found at the anterior end of a parasite.

20 seconds per 50 ml.

4) By means of X-ray fluoroscopy, the parasite body, particularly the scolex which is usually located at the upper part of the jejunum, is confirmed to descend in the intestinal lumen with the flow of Gastrografin.

5) Additional 100 to 300 ml of Gastrografin is administered at adequate intervals, while monitoring the descent of the parasite.

6) When the parasite reaches the lower part of the sigmoid colon and the rectum, the patient is forced to defecate.

7) Examination of the expelled parasite confirms the presence of the scolex at the anterior end of the parasite.

The results of Gastrografin treatment in 6 cases were summarized in the following Table 1.

The entire procedure, starting from the initial administration of Gastrografin until the discharge of parasites, took 30 to 50 minutes. As shown in Photos. 1 and 2., the parasite bodies descending in the intes-

tinal lumen were clearly demonstrated under the X-ray fluoroscopy. Additional administration of cathartic was unnecessary because Gastrografin has a high osmotic pressure of 1,900 mOsm/l and causes a transient osmotic diarrhea in patients (Leonidas *et al.*, 1976). Aside from complaints of minor diarrhea, headache and epigastric pain by 2 patients, no other serious side effect was noticed. These complaints were probably due to tiredness and slight dehydration caused in patients during treatment. All treated patients were restored to health within a few hours after the discharge of parasites.

As shown in Photo. 3, tapeworms expelled remained intact, each possessing the scolex at the anterior end and were showing the active waving motion and elastic movement. No apparent destruction was detected on the parasite bodies under a magnifier, though more minute examinations were being undertaken.

In Damaso de Rivas' method and Kihara

for intestinal tapeworm infections

Amounts of Gastrografin administered	Time required for treatment	Side effects	Tapeworm discharged	
			Scolex	Length
200 ml † 300 ml §)	40 min.	none	+    )	7.25 m
100 ml 100 ml 100 ml §)	35 min.	Diarrhea (once)	+	5.40 m
100 ml 100 ml 50 ml	50 min.	Slight headache, Diarrhea (twice), Epigastric pain	+	5.25 m
200 ml 300 ml	30 min.	none	+	4.50 m
100 ml 200 ml	40 min.	none	+	8.80 m
100 ml 150 ml	35 min.	none	+	4.40 m

ical examination. † Initial amounts administered. § Additional amounts



Photo. 1 *Taenia saginata* (arrows) revealed as filling defect in the small intestine by roentgenography, in case number 1.



Photo. 2 *Diphyllobothrium latum* (arrows) revealed as filling defect in the descending colon by roentgenography, in case number 6.

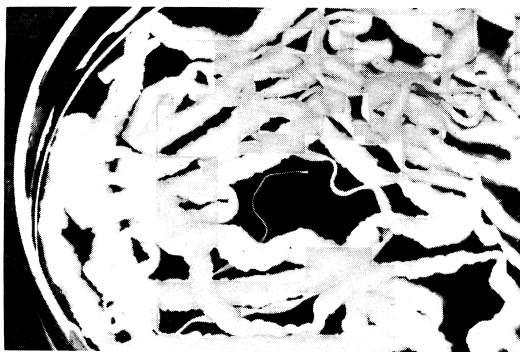


Photo. 3 *Taenia saginata* expelled by Gastrografin treatment, in case number 4.

*et al's* modification for treating intestinal tapeworm infection, magnesium sulfate solution, glycerin, magnesium sulfate solution and glycerin mixture, and finally warmed physiological saline solution, are serially administered to the patient through a duodenal tube. It is pointed out that intact tapeworms with scolices can always be expelled in this treatment. In the authors' experience of Kihara *et al's* modification, however, there was a case of *Taeniasis saginata* in which watery diarrhea and severe abdominal pain lasted long after the treatment.

The duodenal administration of Gastrografin showed a complete expulsive effect in all the treated cases. The operation was quite easy and safe. It was also a great advantage of this therapy that descent of parasites could be clearly followed with X-ray fluoroscopy and no additional administration of cathartic was necessary.

Gastrografin is a water-soluble contrast medium and contains in aqueous solution 76% of sodium methylglucamine amidotrizoate and 0.1% of a wetting-agent, polysorbate 80 (Tween 80), with a specific gravity of 1.422 and pH 6.0-7.6. It contains 37% bound iodine. As mentioned above, this medium causes a transient osmotic diarrhea when introduced into the intestinal canal. In considering these physicochemical characteristics of Gastrografin, some preliminary examinations were attempted with 3 patients of *Taeniasis saginata*. In case number 2 shown in the table, to examine a hypertonic solution for the

expulsive effect, 200 ml of a fluid containing 20% of mannitol and 60% of barium sulfate, a contrast medium, and having a nearly similar osmotic pressure to Gastrografin, was administered through a duodenal tube. The descent of the parasite was not confirmed fluoroscopically. In case number 3, to examine the surface-active agent, 200 ml of a fluid containing 0.1% of Tween 80 and 60% of barium sulfate was introduced but no expulsive effect was manifested. The concentration of Tween 80 in this fluid was same as in Gastrografin. In case number 4, 200 ml of Urografin, a contrast medium for the urinary passage, containing only 60% of sodium methylglucamine amidotrizoate which was the main component of Gastrografin, was administered in the same manner. The tapeworm was observed fluoroscopically to descend until the ileocecal region but no discharge of the parasite occurred.

The mechanism of the expulsive effect shown by Gastrografin can not be clearly explained. Presumably the enhancement of intestinal peristalsis, the purgative action, the surface-active effect, the direct action to parasites and other activities of Gastrografin components may manifest collectively this therapeutic effect. Although the detailed examination should be necessary with more cases of tapeworm infections, it is worthy of note that this therapy is safe and effective for intestinal tapeworm infections.

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## 短 報

ガストログラフィン十二指腸内注入による無鉤条虫症  
および広節裂頭条虫症の新治療法

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腸管条虫駆虫法の1方法に Damaso de Rivas および木原らの変法がある。これらは硫苦水、グリセリンおよびそれらの混合液、加温生食水を十二指腸内に順次注入する駆虫法で、虫体破壊がなく副作用も少いといわれる。しかし、加温液注入による腸粘膜障害や施行後に下痢が継続する懸念が残る。

今回報告した駆虫法は、消化管造影剤であるガストログラフィンを十二指腸ゾンデを通じて十二指腸水平部に注入する方法である。無鉤条虫症4例、広節裂頭条虫症2例に試み、いずれの症例においても頭節を持

つたままで活発に運動する虫体の完全排出が得られた。排出した虫体には破壊、損傷を認めなかつた。一部の患者が軽度の下痢、頭痛、腹痛を訴えたほかは何らの副作用もみられなかつた。本法では下剤投与の必要がなく、X線透視下に虫体下降を追跡しつつ、投与ガストログラフィン量を適宜増減しえる利点もある。さらに治療例を重ねるとともに、本法の駆虫効果の機転について検討する必要があるが、本駆虫法は安全かつ効果的な腸管条虫症の新治療法と考えられる。