

Simple drainage versus drainage with minocycline infusion for symptomatic hepatic cysts

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Percutaneous treatment of symptomatic hepatic cysts includes simple drainage and drainage with sclerosing agents. We compared the efficacy of simple drainage with that of drainage with minocycline infusion for treating symptomatic hepatic cysts. We retrospectively evaluated 11 patients who underwent percutaneous drainage of symptomatic hepatic cysts. In seven cases, minocycline infusion was added at the discretion of the clinician. Cyst volume was evaluated before drainage, immediately after drainage, and after long-term follow-up. Cyst volume was calculated before treatment by multiplying the orthogonal diameters using the ellipsoid formula. Relapse was defined as the regrowth of the cyst with symptoms. Cyst volume immediately after drainage and after long-term follow-up was significantly less than that before treatment for the drainage with minocycline infusion group ($p < 0.05$) but not for the simple drainage group. The relapse rates were 25% (1/4) for the simple drainage group and 0% for the drainage with minocycline infusion group. Drainage with minocycline infusion could be a promising option for treating symptomatic hepatic cysts, although simple drainage was not reliable.

Key Words: symptomatic hepatic cyst, drainage, sclerosing agent, minocycline

Benign hepatic cysts are the most common pathology of the liver, with a prevalence of 2.5–7%.^(1,2) On the other hand, symptomatic hepatic cysts are extremely rare. Symptomatic hepatic cysts can cause epigastric pain, abdominal discomfort, vomiting, and jaundice. They require percutaneous or surgical treatment, the former of which includes simple drainage and drainage with sclerosing agents. Sanfelippo *et al.*⁽³⁾ reported that simple drainage was effective for treating large hepatic cysts. Percutaneous drainage alone sometimes results in relapse, and aspirated hepatic cysts fill up again. To improve the effect of percutaneous drainage, the use of sclerosing agents that destroy the inner cyst lining was introduced.⁽⁴⁾ Ethyl alcohol (95–99%) is the most frequently used sclerosing agent.^(5–9) Frequent periprocedural complications include immediate burning pain, fever and intoxication. The complications with minocycline used as a sclerosing agent are less serious than those of alcohol.^(10,11)

To the best of our knowledge, no study has compared simple drainage with drainage with minocycline infusion for treating symptomatic hepatic cysts. In this study, we compared the

efficacy of simple drainage with that of drainage with minocycline infusion for treating symptomatic hepatic cysts.

Patients and Methods

Patients. We retrospectively analyzed the data of consecutive patients who underwent percutaneous drainage of symptomatic hepatic cysts at the Tokyo Medical Center between April 2015 and October 2019. Minocycline infusion was added at the discretion of the clinician. Symptomatic hepatic cysts had been diagnosed using computed tomography (CT) and abdominal ultrasound. We excluded patients who had not undergone a follow-up CT after treatment. The institutional review committee of the Tokyo Medical Center approved the protocol of this study.

Treatment. The procedure was performed using a pigtail-type drainage set with the patient under local anesthesia combined with sedation. Ultrasound was used to monitor the puncture of the cyst, and fluoroscopy was used to guide the insertion of the drainage tube. In the minocycline infusion group, 500 mg of minocycline hydrochloride dissolved in 20 ml of saline was infused into the cyst. Some patients received a second minocycline infusion.

Outcome evaluation. The cyst underwent a CT scan before treatment, immediately after drainage, and after long-term follow-up (≥ 6 months). Cyst volume was calculated before treatment by multiplying the orthogonal diameters using the ellipsoid formula $V = D1 \times D2 \times D3 \times 0.523$. Cyst volume was also calculated immediately after treatment and after follow-up and compared to the baseline volume (before treatment) to obtain the cyst volume reduction rate. The total amount of fluid drained was measured during drainage. Adverse events related to the treatment were also investigated. Relapse was defined as the regrowth of the cyst with symptoms.

Statistics. All continuous variables are expressed as mean \pm SD. Differences between the two groups were detected using the Welch *t* test for continuous data. Categorical secondary outcomes were compared using the χ^2 test.^(12,13) Differences between the cyst volume at baseline and after treatment in each group were detected using a paired *t* test. Statistical significance was set at $p < 0.05$. All statistical analyses were performed using StatMate IV software (ATOMS, Tokyo, Japan).

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Results

Nineteen patients had symptomatic hepatic cysts at the Tokyo Medical Center between April 2015 and October 2019. Six patients received conservative treatment with no drainage, and two patients did not undergo a follow-up CT after simple drainage. These eight patients were excluded from analysis. Four patients underwent simple drainage and seven patients underwent drainage with minocycline infusion. The characteristics of both groups are summarized in Table 1. Culture tests were negative for all patients. Figure 1 shows representative CT images before and after drainage with minocycline infusion. The volume reduction rates immediately after drainage were 56.1% for the simple drainage group and 89.3% for the drainage with minocycline infusion group. The volume reduction rates after long-term follow-up were 46.8% for the simple drainage group and 94.6% for the drainage with minocycline infusion group. The cyst volumes immediately after drainage and after long-term follow-up were significantly smaller than the cyst volume before treatment for the drainage with minocycline infusion group ($p < 0.05$) but not for the simple drainage group. The relapse rates were 25% (1/4) for the simple drainage group and 0% for the drainage with minocycline infusion group. No complications occurred in either group.

Discussion

To the best of our knowledge, this was the first study that compared the efficacy of simple drainage with that of drainage

with minocycline infusion for treating symptomatic hepatic cysts. Although drainage with minocycline infusion significantly reduced the volume of the symptomatic hepatic cysts, simple drainage did not.

Simple drainage is sometimes ineffective. It has a high relapse rate because it does not address how cysts begin and grow (the walls of cysts consist of a layer of epithelial cells that produce liquid).⁽¹⁴⁾ Minocycline hydrochloride is used as a sclerosing agent because of its extremely low pH, which causes a reaction by the cell wall that leads to fibrosis and adhesion of the cell walls.⁽¹⁵⁾ In our study, no relapse occurred in the drainage with minocycline infusion group.

The cyst volumes before treatment were 1,292 ml for the simple drainage group and 1,686 ml for the drainage with minocycline infusion group, and those immediately after drainage were 467 ml for the simple drainage group and 111 ml for the drainage with minocycline infusion group. Thus, the reduction volumes were 825 ml for the simple drainage group and 1,575 ml for the drainage with minocycline infusion group. On the other hand, the amounts of fluid drained during the drainage period were 1,182 ml from the drainage with minocycline infusion group and 960 ml from the simple drainage group, which was greater than the reduction volume, indicating that liquid continued to be produced during simple drainage. Conversely, the amount of fluid drained from the drainage with minocycline infusion group was less than the reduction volume, indicating that liquid stopped being produced after minocycline infusion. Furthermore, the residual fluid was resorbed. Sparchez *et al.*⁽¹⁶⁾ also reported that the cyst volume decreased gradually

Table 1. Patient characteristics and outcomes

Characteristics	Simple drainage	Drainage with minocycline infusion	<i>p</i> value
Number	4	7	
Gender (male/female)	2/2	2/5	0.83
Age (years)	75.8 ± 12.8	72.7 ± 16.0	0.74
Cyst volume before treatment (ml)	1,292 ± 1,376	1,686 ± 1,010	0.64
Period of drainage	19.0 ± 12.7	16.7 ± 10.5	0.97
Amount of drainage	960 ± 570	1,182 ± 545	0.55
Cyst volume immediately after drainage (ml)	467 ± 527	111 ± 164 *	0.27
Reduction rate immediately after drainage	56.1 ± 65.9%	89.3 ± 13.1%	0.39
Period of follow-up (days)	430 ± 104	537 ± 502	0.61
Cyst volume after long-term follow-up (ml)	927 ± 1,395	94.9 ± 207 *	0.32
Reduction rate after long-term follow-up	46.8 ± 61.1%	94.6 ± 10.9%	0.22
Relapse rate	25% (1/4)	0%	0.76

Mean ± SD. *Paired *t* test: comparison with cyst volume before treatment, $p < 0.05$.

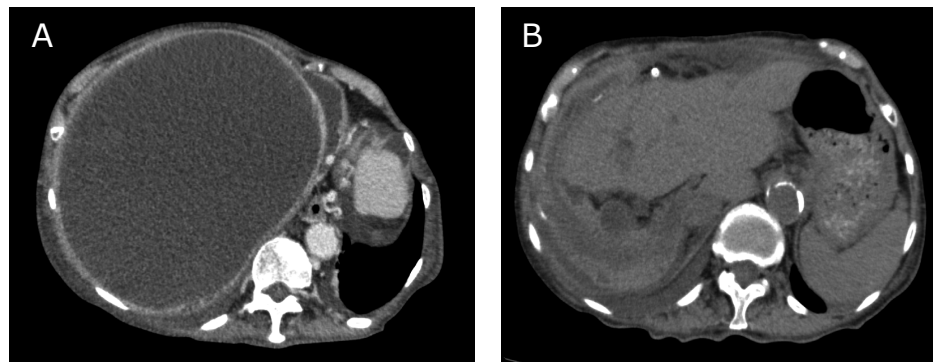


Fig. 1. (A) Representative CT image of symptomatic hepatic cyst before treatment and (B) after drainage with minocycline infusion.

after one sclerosing therapy session because the residual fluid was resorbed, possibly via microscopic communication between the cyst and the surrounding liver parenchyma. These findings indicate the effectiveness of minocycline infusion.

Furumaya *et al.*⁽¹⁷⁾ conducted a systematic review of drainage with sclerosing agents vs surgery for treating symptomatic hepatic cysts. The relapse rates were 0% for drainage with sclerosing agents, 5.6% for laparoscopic cyst deroofing, and 7.7% for open surgical management, and the major complication rates were 0.8%, 17%, and 1.4%, respectively. The results of the systematic review suggested a step-up treatment strategy in which first-line treatment is drainage with sclerosing agents and the second-line treatment is laparoscopic cyst deroofing.

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The limitations of this study include its retrospective design and its small sample size, especially that of the simple drainage group. Because the results of simple drainage seemed to be inferior to those of drainage with minocycline infusion, it was difficult to accumulate cases treated with simple drainage.

In conclusion, drainage with minocycline infusion could be a promising option effective for treating symptomatic hepatic cysts, and simple drainage was not reliable.

Conflict of Interest

No potential conflicts of interest were disclosed.

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