NON-SURGICAL NON-CHEMICAL ATTEMPTS TO TREAT ECHINOCOCCOSIS: DO THEY WORK?

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\textsuperscript{2}-WHO-Collaborating Centre for Prevention and Treatment of Human Echinococcosis, Besançon, France
Inactivation of the germinal layer

Evacuation of the endocyst

PAIR
Radiofrequency
HIFU

OTHER PERCUTANEOUS TREATMENTS
- PEVAC
- MoCaT
- Dilatable Multifunction Trocar
- Percutaneous puncture, Drainage and curettage
- Grinder
- ....

SURGERY

Treatment of complications: infection, biliary obstruction & fistulas

Courtesy of Prof Seitz, Bonn University (2000)
<table>
<thead>
<tr>
<th>CE1</th>
<th>CE3a</th>
<th>CE2</th>
<th>CE3b</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Pair" /></td>
<td><img src="image2.png" alt="Ultrasound" /></td>
<td><img src="image3.png" alt="Ultrasound" /></td>
<td><img src="image4.png" alt="Ultrasound" /></td>
</tr>
</tbody>
</table>

| PAIR, Catheterization | Other percutaneous treatments ?????


<table>
<thead>
<tr>
<th>IDEAL TREATMENT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TECHNICALLY “MATURE” ALTERNATIVE TO SURGERY</strong></td>
<td>✔️</td>
</tr>
<tr>
<td><strong>APPLICABLE IN ALL ACTIVE PARASITE STAGES</strong></td>
<td>✖️</td>
</tr>
<tr>
<td><strong>APPLICABLE IN RESOURCE-POOR AREAS</strong></td>
<td>±</td>
</tr>
<tr>
<td><strong>EFFICACY AND SAFETY TESTED IN CONTROLLED TRIALS ON A LARGE NUMBER OF PATIENTS WITH LONG-TERM FOLLOW-UP</strong></td>
<td>✖️</td>
</tr>
</tbody>
</table>
NON-SURGICAL DRAINAGE TECHNIQUES
Use of PAIR in human cystic echinococcosis

Carlo Filice*, Enrico Brunetti Acta Tropica 64 (1997) 95–107

- parasitic cysts: 141 in 85 pts (in 2 weeks)
- anaphylactic shock: 0
- pregnant women: 6
- (1 close to delivery -10 cm cyst)
- children < 5 yo: 5
- 1 patient with 23 abdominal cysts - 6 catheters used
- 1 anaphylactoid reaction

Courtesy of Prof Filice, Pavia University (1993)
PAIR

Percutaneous imaging-guided treatment of hydatid liver cysts: Do long-term results make it a first choice?

Adnan Kabaalioğlu*, Kağan Çeken, Emel Alimoglu, Ali Apavdin


Mean follow-up 40.4 months

Table 3
Analysis of failures according to cyst types

<table>
<thead>
<tr>
<th>Category</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 4 result</td>
<td>–</td>
<td>–</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>Category 5 result</td>
<td>–</td>
<td>1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>–</td>
<td>1</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

Follow-up 12 months

Efficacy and Safety of PAIR for Cystic Echinococcosis: Experience on a Large Series of Patients from Bulgaria

Branimir Golemanov, Nikola Grigorov, Rumiana Mitova, Jordan Genov, Dimitar Vuev, Francesca Tamarozzi, and Enrico Brunetti*

Post-treatment changes of the cysts at the 6-month follow-up

Number of cysts according to stage, size, and location

<table>
<thead>
<tr>
<th>Outcome</th>
<th>&lt; 5 cm</th>
<th>5–10 cm</th>
<th>&gt; 10 cm</th>
<th>&lt; 5 cm</th>
<th>5–10 cm</th>
<th>&gt; 10 cm</th>
<th>&lt; 5 cm</th>
<th>5–10 cm</th>
<th>&gt; 10 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disappearance</td>
<td>32L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete obliteration</td>
<td>30L</td>
<td>8L, 2K, 2S</td>
<td></td>
<td>2L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 75% obliteration</td>
<td>14L</td>
<td>20L, 2K, 1S</td>
<td></td>
<td>2L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50–75% obliteration</td>
<td>74L, 18A</td>
<td></td>
<td></td>
<td>4L, 1A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent liquid content</td>
<td>6L</td>
<td>42L, 45A</td>
<td></td>
<td>2L, 3A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No change in structure</td>
<td></td>
<td>12L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>296</td>
<td>12</td>
<td>14</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>348</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

L = Liver; K = kidney; S = spleen; A = abdominal cavity.
44 Case studies; 5 Narrative reviews; 1 non-randomized trial

Only 2 randomized trials comparing PAIR with ABZ or surgery - Khuroo 1993 and 1997

Flaws: randomization method; blinding of outcome assessor

Small numbers (20 vs 10 - ABZ and 25 each - surgery)

Too short follow-up (<18 months)
The problem of occult biliary fistula
Percutaneous treatment of giant abdominal hydatid cysts: long-term results

S. Men, C. Yücesoy, T. R. Edgüer, B. Hekimoğlu


1. Puncture and aspiration of the cyst
2. Injection of hypertonic saline and resultant detachment of the endocyst
3. Catheterization and evacuation of the fluid content, then free drainage
4. Cystography
   - No leak or fistula: No sclerotherapy
   - Cystogram or leak
5. Alcohol sclerotherapy
   - Daily drainage < 10 ml: Remove the catheter
   - Daily drainage > 10 ml: Keep the catheter until drainage < 10 ml/day

No sclerotherapy; Leave the catheter in cavity until the fistula heals or the hole causing the leak closes.
<table>
<thead>
<tr>
<th>Method</th>
<th>References</th>
<th>Cysts N</th>
<th>Cysts types</th>
<th>Follow-up</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical suction with wide bore catheter</td>
<td>Mohan 2011</td>
<td>13</td>
<td>Gharbi III</td>
<td>6-24 months</td>
<td>7-40 days</td>
</tr>
<tr>
<td>D-PAI</td>
<td>Giorgio 2008</td>
<td>151</td>
<td>Active cysts</td>
<td>14-204 months</td>
<td>2-7 days</td>
</tr>
<tr>
<td>PEVAC</td>
<td>Sakaguchi 2007 Shipper 2002</td>
<td>1</td>
<td>Gharbi type IV Gharbi type II</td>
<td>4 months &lt;30 months</td>
<td>Not reported 8-55 days</td>
</tr>
<tr>
<td>MoCaT</td>
<td>Akhan 2007</td>
<td>3 (muscle)</td>
<td>Gharbi type I, II and III</td>
<td>36-57 months</td>
<td>1-54 days</td>
</tr>
<tr>
<td>Catheterization with hypertonic saline and alcohol</td>
<td>Akhan 1993 (sheep) Akhan 2007</td>
<td>7</td>
<td>Gharbi type I and III</td>
<td>6-40 months</td>
<td>6 days</td>
</tr>
<tr>
<td>Coaxial catheter</td>
<td>Gabal 2005</td>
<td>17 (various organs)</td>
<td>Complicated or large size; various Gharbi types</td>
<td>1 year</td>
<td>1 day</td>
</tr>
<tr>
<td>Dilatable Multifunction Trocar</td>
<td>Haddad 2000</td>
<td>8</td>
<td>Gharbi type IV (CE3b?)</td>
<td>1-48 months</td>
<td>2-13 days</td>
</tr>
<tr>
<td>Puncture, Drainage and Curettage</td>
<td>Wang 1994 (Chinese)</td>
<td>361</td>
<td>16 univesicul. 9 multivesicul. 4 CE3a?</td>
<td>5 years</td>
<td>?</td>
</tr>
<tr>
<td>Cutting instrument</td>
<td>Saremi 1995</td>
<td>32</td>
<td>16 univesicul. 9 multivesicul. 4 CE3a?</td>
<td>9-48 months</td>
<td>1 month</td>
</tr>
</tbody>
</table>
• Multiple cysts embedded in dense fibrosis
• Drainage of each cyst does not make sense...
• The « central cavity » is not a cyst: source of complications, it may however be considered to be « the dying part » of the lesion
• tumor-like ‘regional’ treatments:
  – Trans-catheter arterial chemoembolization (TACE) ?
  – Trans-arterial infusion( TAI) ?
  Apparently never attempted...
NON-CONVENTIONAL PROCEDURES TO TREAT ECHINOCOCCOSIS
Thermal ablation with RADIOFREQUENCY

- 3 hepatic CE3b cysts in 2 patients (Brunetti E, Filice C, Lancet 2001)
- 6 hepatic cysts in 5 patients (@ May 2003)
- LeVeen 14G Needle with 10 retractable curved electrode; 7 min application
- No alcohol; 1mo prophylactic ABZ

RFA outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Treatment</th>
<th>Follow-up (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sco 2001</td>
<td>Abscess drainage</td>
<td>1.5</td>
</tr>
<tr>
<td>Ali 2001</td>
<td>ABZ</td>
<td>2</td>
</tr>
<tr>
<td>Gra 2002</td>
<td>ABZ</td>
<td>3.5</td>
</tr>
<tr>
<td>Vac 2002</td>
<td>Surgery</td>
<td>0.5</td>
</tr>
<tr>
<td>Con 2001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complication
Relapse
Surgery
Thermal ablation with RADIOFREQUENCY

- 1 patient with 1 large hepatic CE2 cyst
- Aspiration $\rightarrow$ RFA 12’ $\rightarrow$ Absolute alcohol
- 2-months ABZ post-RFA
- 6-months follow-up

- 29 patients with 63 hepatic cysts
- Stage?
- Aspiration $\rightarrow$ RFA with multiple needles
- 12-months follow-up
ADVANTAGES

• No aspiration/evacuation
• Easy to perform

DISADVANTAGES

• Cysts either superficial, peritoneal or next to hollow structures cannot be treated
• Expensive
• Complications

WHAT NEXT?

• Focus on CE2 and CE3b cysts
• Rigorous assessment *ex vivo* and *in vivo*
• Need for ABZ?
Cystic echinococcosis of the liver and lung treated by radiofrequency thermal ablation: An ex-vivo pilot experimental study in animal models.

Vincenzo Lamonaca, Antonino Virga, Marta Idà Minervini, Roberta Di Stefano, Alessio Provenzani, Pietro Tagliareni, Giovanna Fieres, Angelo Luca, Giovanni Vizzini, Ugo Palazzo, Bruno Gridelli

Table 1: Baseline characteristics of liver and lung cysts and results of treatment with RTA

<table>
<thead>
<tr>
<th></th>
<th>Liver (n = 9)</th>
<th>Lung (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Post-RTA</td>
</tr>
<tr>
<td>Cyst volume (mL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>40.5</td>
<td>14.9</td>
</tr>
<tr>
<td>Range</td>
<td>8.3-61.6</td>
<td>2.0-28.3</td>
</tr>
<tr>
<td>Fluid echo pattern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anechoic</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Anechoic + ground</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Disomorphic</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Proligera status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhered</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Focally detached</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Detached</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wall calcification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(any)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Daughter/adjacent cysts</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Internal</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>External</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Killing rate (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(RTA)</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Pericyst necrosis (cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (range)</td>
<td>0.64 (0-2)</td>
<td></td>
</tr>
<tr>
<td>External temperature (°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average of peaks</td>
<td>42.9</td>
<td></td>
</tr>
<tr>
<td>Range of peaks</td>
<td>23-69</td>
<td></td>
</tr>
<tr>
<td>Gradient T (range)</td>
<td>11.9-58.3</td>
<td></td>
</tr>
</tbody>
</table>
And in AE??

- Non-necrotic central lesions,
- Hemangioma-like or metastasis-like early lesions,
- Pseudo-abscess lesions in immune suppressed patients,
  ... could theoretically be treated using Radiofrequency Thermal Ablation...

Apparently never attempted...!
Does it work?

Should be tested in experimental pre-clinical models...
Conversion of mechanical energy into heat (hyperthermia)

Acoustic cavitation (due to tissue resonance)

COAGULATIVE NECROSIS

The size depends on the frequency and geometry of the source

Under normal exposure parameters (1.7 MHz), the lesion is ellipsoidal, with size of 1.5 x 15 mm
High Intensity Focused Ultrasound

<table>
<thead>
<tr>
<th>Study</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Parasitology 121 (2009)</td>
<td>PSC in vitro</td>
</tr>
<tr>
<td>Echinococcus granulosus: Protoscolicidal effect of high intensity focused ultrasound</td>
<td>PSC +/- SAP in vitro</td>
</tr>
<tr>
<td>Xiaoyi Zou (^{ab}), Junan Wang (^{ab}), Hailong Zhao (^{c}), Jing Zhang (^{ab}), Weihua Wu (^{ab}), Bin Ye (^{ab,\ast})</td>
<td></td>
</tr>
<tr>
<td>In vitro protoscolicidal effects of high-intensity focused ultrasound enhanced by a superabsorbent polymer</td>
<td>Cysts +/- SAP +/- UCA ex vivo</td>
</tr>
<tr>
<td>Parasitol Res (2013)</td>
<td></td>
</tr>
<tr>
<td>Jing Zhang (^{ab}), Bin Ye (^{ab}), Jing Kong, Hui Cai, Yifeng Zhao, Xiumin Han, Faqi Li</td>
<td></td>
</tr>
<tr>
<td>The destructive effects of high-intensity focused ultrasound on hydatid cysts enhanced by ultrasound contrast agent and superabsorbent polymer alone or in combination</td>
<td>Cysts transplanted IP in rabbits +/-SAP +/- UCA</td>
</tr>
<tr>
<td>Parasitol Res (2013)</td>
<td></td>
</tr>
<tr>
<td>Hui Cai, Lu-Lu Chen, Bin Ye, Ai-Bo Liu, Jing Zhang, Yi-Feng Zhao</td>
<td></td>
</tr>
<tr>
<td>The damages of high intensity focused ultrasound to transplanted hydatid cysts in abdominal cavities of rabbits with aids of ultrasound contrast agent and superabsorbent polymer</td>
<td></td>
</tr>
<tr>
<td>Parasitol Res (2013)</td>
<td></td>
</tr>
<tr>
<td>Ai-Bo Liu, Hui Cai, Bin Ye, Lu-Lu Chen, Meng-Ying Wang, Jing Zhang, Yi-Feng Zhao</td>
<td></td>
</tr>
</tbody>
</table>

And in AE??

One Chinese case of ‘giant Echinococcus multilocularis’ treated by HIFU: Zhang YG, Zhang CW, Dou LJ. 2005

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mortality rate of protoscolices (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: blank control (common ultrasound)</td>
<td>4.07 (33/810)</td>
</tr>
<tr>
<td>B: alone HIFU (100 W) control</td>
<td>15.19 (122/803)</td>
</tr>
<tr>
<td>C: HIFU (100 W) + SAP (0.1 g)</td>
<td>48.66 (398/818)</td>
</tr>
<tr>
<td>D: HIFU (100 W) + UCA (0.1 ml)</td>
<td>38.67 (312/807)</td>
</tr>
<tr>
<td>E: HIFU (100 W) + UCA (0.1 ml) + SAP (0.1 g)</td>
<td>67.75 (542/800)</td>
</tr>
</tbody>
</table>
ADVANTAGES
• Non invasive (?)

DISADVANTAGES
• Expensive
• Long time required
• General anesthesia

WHAT NEXT?
• Rigorous assessment *ex vivo* and *in vivo*
• Different cyst types and sizes
• Experimental studies in AE
• Albendazole?
Gamma-knife surgery: successful clinical application in one case of cerebral AE in Austria

Schmid et al, Clin Infect Dis, 1998

But fatal outcome after 14 years of ABZ interruption (respiratory failure due to lung location...)

Progressive alveolar echinococcosis after discontinuation of anthelmintic therapy


LETTER TO THE EDITOR
Open Access

Progressive alveolar echinococcosis after discontinuation of anthelmintic therapy

Mellinger1, Christina Stoeckl1, Marion Pollheimer1, Peter Kern1, Emil C Reisinger1, Katharina Seeber2, Robert Krause2, Holger Flick1* and Martin Horeni1,2*
 Ionizing radiations / Radiotherapy

Experimental studies:

• **In vitro**: 50-100 Gy ionizing irradiation
  
  **Short term**
  - No release of alkaline phosphatase activity
  - No big changes in protein expression pattern and protease activities in vesicle fluid, but
  - Morphological and ultrastructural alterations

  **Long term**
  - Decrease in proliferation and growth of *E. multilocularis*

  *Pohle et al, Exp Parasitol, 2011*

- **LD50**: 28.5 Gy for X-rays; 15.5 Gy for carbon-ion
- MtDNA damage
- Apoptosis (measured by Caspase 3)

- **Heavy-ion radiotherapy**: successful to treat CHC and lung cancer
- **In vitro study on protoscoleces**

  *C & D: 30 Gy X-Ray irradiation*
  *E & F: 30 Gy carbon-ion irradiation*

  *Zhou et al, PLOS Neglect Dis, 2013*
Experimental studies:

- In vivo: rat model
  - 6-MeV radiotherapy at 20, 40 and 60 Gy/8f, every 3 days; 8 times
  - Inhibitory rates of 50%, 72% and 82% respectively

**Figure.** Ultrastructural changes in each group (Original magnification ×5000). **A:** Control group. Vesicle structure was normal; nucleus was complete, nucleolus was clear, and microvilli were spread and distributed uniformly in the germinal layer. **B:** 20 Gy irradiation treatment group. Microvilli were reduced, thickened and shortened; spread was untidy, and cells were decreased in cellular areas. **C:** 40 Gy irradiation treatment group. The laminated layer was loosened, sequence of microvilli was disordered, cells were edematous, and a compact electronic lump was found. **D:** 60 Gy irradiation treatment group. Sequence of microvilli was disordered, cells were edematous, mitochondria were swollen, and endoplasmic reticula were enlarged.
Clinical cases: no properly studied case reported since 1931 (Dévé)

Radiation therapy for resistant sternal hydatid disease

250 cGy/day  5 days/week  1y follow-up
At the very beginning of the XXth century (1904-1930), various (and serious) experimental studies concluded that « the hope of treating hydatid cysts by radiotherapy was a pure therapeutic illusion »...! (review in the Presse Médicale, 1927, cited in the MD thesis of Perrin, 1932!)

Bone hydatidosis is often difficult to treat by surgery, and usually resistant to ABZ...

Clinical cases of bone CE treated by radiotherapy:
‘old’ paper, in the 1950s!
Bao et al, 2010 [chinese]
NON-SURGICAL DRAINAGE
TECHNIQUES WITH A PALLIATIVE
OBJECTIVE
Biliary fistula in CE

- Biliary tract complications  60% of all complications
- Associated with increased morbidity and hospitalization time
- Communication with biliary tree  2-42% of cases
  - Occult rupture  10-37%
  - Frank rupture  3-17%
  
  *if >5mm, in 65% of cases: hydatid material into biliary duct*

- After percutaneous treatment  1.7-6.2%
  - If evacuation of the content  up to 55.5%
- After surgery  14-22.3%

- Predictive factors
  - Size >7.5 cm
  - Cyst type: CE2 and CE4, fibrotic and calcified wall
  - Symptoms and signs: jaundice, nausea, vomiting, ALP and γGT, US signs
  - Recurrent cyst

Non-surgical treatment of biliary fistula in CE

- Case reports/series = 50
- Multicentric studies = 1
  

- Reviews = 2
  
  *Ramia et al Langenbecks Arch Surg. 2012;397(6):881-7*

- No randomized clinical trials or meta-analysis

**Biliary fistula after treatment for hydatid disease of the liver: When to intervene**

*World J Gastroenterol. 2013 January 21; 19(3): 355-361*

- Maximum post-intervention biliary drainage < 102 mL

- Waiting 5.5 days for spontaneous closure
  
  Se 83.3-91.1%  Sp 91-97%
Non-surgical treatment of biliary fistula in CE - Endoscopic retrograde cholangio-pancreatography -

ERCP: EVIDENCE LEVEL IV, GRADE OF RECOMMENDATION C

- allows an elective intervention
- can provide definitive treatment
- prevents exploration of the bile duct during surgery
- decreases the incidence of postoperative fistula (11.1% to 7.6%)
Non-surgical treatment of biliary fistula in CE

- Other techniques -

1. Refractory Cystobiliary Fistula Secondary to Percutaneous Treatment of Hydatid Cyst: Treatment with N-Butyl 2-Cyanoacrylate Embolization
   - Murat Canyigit, Mehmet Gumus, Nurdan Cay, Bekir Erol, Mustafa Karaoglanoglu, Okan Akhan
   - Cardiovasc Intervent Radiol (2011) 34:S266–S270

2. Percutaneous Transhepatic Endobiliary Drainage of Hepatic Hydatid Cyst with Rupture into the Biliary System: An Unusual Route for Drainage
   - Mehmet Inal, Süreyya Soyupak, Erol Akgül, Hüseyin Ezici

3. Percutaneous Alcohol Sclerotherapy of a Hepatic Hydatid Cyst after Balloon Occlusion of a Large Biliary Communication
   - Jozsef Varro, Laji Mathew, Reji Philip Athyal, Abdulrahman H. Khafagy
   - Med Princ Pract 2011;20:477–479

4. A Complicated Postsurgical Echinococcal Cyst Treated with Radiofrequency Ablation
   - L. Thanos, S. Mylona, P. Brontzakis, N. Ptohis, K. Karaliotas
Bacterial infection and biliary obstruction

• Among the main complications of hepatic AE: impact on prognosis

• Long treated by palliative operation/surgical anastomosis: recurrence of stenosis; bacterial and fungal super-infections

• Current recommendation: no surgical drainage!

– Percutaneous US- or CT-guided

Palliative procedure for

- Hepatic abscesses
- Obstructive cholangitis

Efficient to:

- Control septic chronic cholangitis
- Prevent the risk of biliary cirrhosis
- Improve nutrition
- Enhance the quality of the immune response

But poor Quality of Life

- External drain
- Pain because of bile leakage
- Iterative procedures

Biliary drainage
Percutaneous trans-hepatic BD
• **Palliative procedure**

• Same indications as PTBD
  ... in order to avoid iterative PTBD

• Same efficiency as PTBD

• Better Quality of Life
  • Iterative procedures but less bile leakage
  • Allows stenting and calibration of bile ducts
  • No external drainage
  • Decreases pain related to bile duct dilation
40 years from introduction of BMZ
30 years from introduction of PAIR

- large randomized trials $\rightarrow$ multicentric
- long-term follow-up
- rigorous pre-clinical studies
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