Risk Factors for Abscess Development Following Percutaneous Microwave Ablation Therapy of Hepatic Tumors

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Objectives

To investigate risk factors associated with post-microwave ablation (MWA) abscess formation.

Background

Intra-hepatic abscess is one of the most common major complications of thermal ablation for hepatic malignances. The presence of a bilioenteric anastomosis has consistently been shown to be a significant risk factor to the development of hepatic abscess following radiofrequency or thermal ablation in general. Microwave ablation (MWA) is a newer heat-based method of thermal ablation that operates on the principle of dielectric hysteresis to produce coagulation necrosis and results in direct heating of targeted tissue.[1] Proposed advantages include less susceptibility to charring[2] and heat-sink phenomenon[3] with potential to create larger ablation zones.

Materials and Methods

Retrospective case-control analysis conducted to identify all hepatic mass MWA procedures performed at a single tertiary academic medical center (**Figure 1**). Assessed independent variables are listed in **Table 1.** Fisher's exact test and logistic regression analysis were employed for statistical analysis.

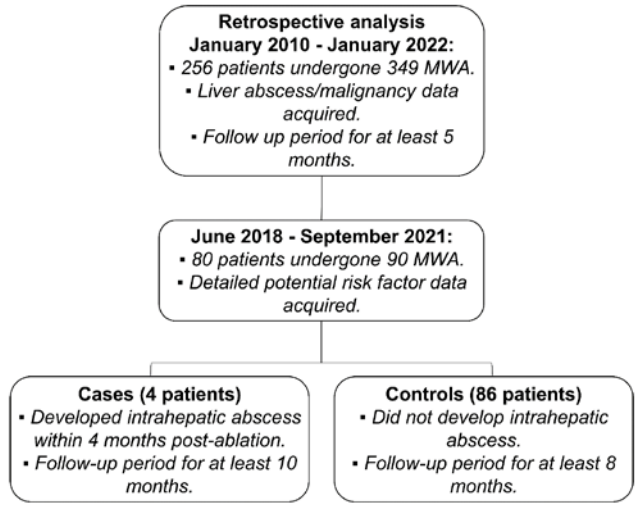

Figure 1. Flowchart illustrating the case-control retrospective analysis design of this study. Note that one case occurred in April 2011.

Results

Table 1. Fisher's Exact Test for Risk Factors Associated with Post-Ablation Abscess

Risk Factor	Odds Ratio	95% Confidence Interval	*p* Value
Cholangiocarcinoma (yes vs. no)	42.0	3.8 to 467.9	$p < 0.01$
Sphincter of Oddi manipulation (yes vs. no)	48.6	4.2 to 556.1	$p < 0.01$
Abnormal alkaline phosphatase (yes vs. no)[a]	13.0	1.3 to 133.9	$p < 0.05$
Child-Pugh class (A vs. B/C)	0.41	0.02 to 7.9	$p = 0.58$
MELD score, 9 or above (yes vs. no)	0.66	0.07 to 6.6	$p = 1.0$
MELD score, 10 or above (yes vs. no)	0.86	0.09 to 8.7	$p = 1.0$
MELD score, 11 or above (yes vs. no)	1.0	0.10 to 10.5	$p = 1.0$
Largest lesion size, greater than 2 cm (yes vs. no)	0.42	0.04 to 4.2	$p = 0.63$
Pre-procedural immunosuppression[b] (yes vs. no)	1.3	0.12 to 12.9	$p = 1.0$
Post-procedural immunosuppression[b] (yes vs. no)	4.4	0.58 to 33.5	$p = 0.18$
History of diabetes (ever vs. never)	1.8	0.24 to 13.2	$p = 0.62$
Preprocedural antibiotics (yes vs. no)	0.18	0.02 to 1.4	$p = 0.13$
Prior liver-directed therapy (yes vs. no)	2.0	0.20 to 19.7	$p = 1.0$
Hydro-dissection (yes vs. no)	6.8	0.57 to 81.3	$p = 0.21$
Probe number (1 vs. 2)	4.4	0.40 to 49.5	$p = 0.28$
Multiple ablations (yes vs. no)	0.44	0.02 to 8.6	$p = 1.0$
Porta hepatis involvement (yes vs. no)	2.7	0.12 to 60.0	$p = 1.0$
Tumor involvement by liver segment[c]	N/A	N/A	*n.s.*

[a]Abnormal alkaline phosphatase serum levels were not found to be significantly correlated ($p = 0.09$) with post-ablation hepatic abscess formation by logistic regression analysis.
[b]Immunosuppressants within 3 months before or after MWA.
[c]Tumor involvement by liver segment was not significantly associated (*n.s.*) with post-ablation abscess formation by Chi square analysis.

Table 2. Clinical Data of Patients Developing Post-Ablation Abscess in this Study

Clinical Data	Case 1	Case 2	Case 3	Case 4
Age (years)	58	64	77	77
Sex	Male	Female	Male	Male
Malignancy	Cholangio.	Cholangio.	Metastatic glucagonoma	HCC
Additional pertinent history	None	Roux-en-Y, CBD stent placement, liver resection, SBRT, TARE, MWA	Roux-en-Y, CBD stent placement, TARE, diabetes	ERCP with CBD and pancreatic duct stent placement, MWA, TACE, diabetes
Pre-procedural immunosuppression	Gemcitabine, cisplatin, paclitaxel	Gemcitabine, cisplatin	None	None
Post-procedural immunosuppression	Folinic acid, fluorouracil, oxaliplatin	Cisplatin, fluorouracil, epirubicin, mitomycin-C	None	None
Liver tumor-directed treatment	MWA, TACE	MWA	MWA	MWA, TACE
Lesion size (cm)	1.3	1.4	1.1	6.4
Segment	6/7	2	4	7
# of probes	1	1	1	2
Pre-procedural antibiotics	Cefoxitin	Cefoxitin	None	None

Table 3. Associated Post-Ablation Complications and Treatment Thereof

Case	Complications and Treatment
1	Empyema (81d, antibiotics, thoracentesis); pleural abscess, pleurobiliary fistula (105d, antibiotics, biliary and pancreatic stents, chest tube); bacteremia, cholangitis/intrahepatic abscess, pleural abscess (128d, antibiotics, pleurobiliary drain placement); malignant ascites (235d, intraperitoneal drain, palliative care); death (260d)
2	Bacteremia (63d, antibiotics); subcutaneous and intrahepatic abscesses, bile leak, biliocutaneous fistula (132d, antibiotics, debridement, drain placement, biliary stent placement, embolization); cholangitis (198d, antibiotics, drain exchange); cholangitis, bilomas vs. microabscesses, pseudoaneurysm, arterio-biliary fistula (295d, antibiotics, biliary stent placement, drain exchange)
3	Bacteremia (21d, antibiotics), intrahepatic abscess (34d, drain placement), biliohepatic fistula (41d, self-resolved)
4	Septic shock, intrahepatic abscess (2-3d, antibiotics, drain placement), death (5d)

Table 4. Isolated Organisms

Case	Organism
1	*Strep mutans, Staph hominis* (empyema); gram-positive cocci, *Lactobacillus* (pleural abscess); Vancomycin-resistant *Enterococcus faecium* (bacteremia, cholangitis/intrahepatic abscess), *Candida glabrata* (pleural abscess)
2	*Streptococcus sanguinis* (blood); *Enterococcus faecalis*, *Candida albicans* (subcutaneous/intrahepatic abscesses); *Klebsiella Variicola*, *Enterobacter cloacae* (cholangitis)
3	Vancomycin-resistant *Enterococcus faecalis* (blood, intrahepatic abscess)
4	*Enterococcus faecalis* (blood, intrahepatic abscess)

Conclusion

Patients with prior Sphincter of Oddi manipulation or cholangiocarcinoma were found to be at greater risk of developing post-MWA abscess.

References

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