

# Acupuncture-Related Cardiac Complications: A Systematic Review

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**ABSTRACT: Background.** The objective of this study is to review acupuncture-related cardiac complications, such as infective endocarditis (IE), cardiac tamponade (CT), pericarditis, and cardiac rupture, as there is no known reported literature to determine the burden of cardiac adverse events due to acupuncture. **Methods.** Structured computerized databases were searched using the special Medical Subject Heading [MeSH]. Manual search using the references of relevant articles was also performed. **Results.** A total of 133 articles were initially retrieved, but careful reading resulted in only 30 cases of relevant cardiac adverse events. There were 8 articles of infective complications (mostly IE), while 22 articles of CT have been reported to date. The diagnoses were made with echocardiography and patients were treated with intravenous antibiotics. The source of the infection was mostly localized to acupuncture needle prick sites, such as earlobes and legs. Mortality rate for post-acupuncture CT was not significantly higher than infective cardiac complication [Pearson's Chi-square = 0.559; likelihood ratio = 0.553]. However, the weighted percentage of death was about 80% in CT vs only 20% mortality for infective cardiac complications. On the other hand, CT was the most common presentation when the needle pricks were close to the heart, and had a clinical presentation of hypotension and venous distention. **Conclusions.** Although the universally reported complications of acupuncture are low, and the procedure itself has been deemed low risk in acupuncture-related literature, these cardiac complications are alarming. To avoid these potentially catastrophic consequences, more education needs to be done for adopting safer techniques.

J INVASIVE CARDIOL 2019;31(4):E69-E72.

**KEY WORDS:** acupuncture, cardiac infection, cardiac tamponade, infective endocarditis, purulent pericarditis

The term “acupuncture” was first coined in 14th century China.<sup>1</sup> As a constituent of traditional Chinese medicine, acupuncture consists of inserting thin needles into the body and is mainly used for chronic pain relief. For ages, it was perceived as an effective and safe alternative to conventional allopathic therapy, but its efficacy has not been proven, and it has been suggested by research that the pain relief in acupuncture is mainly due to the placebo effect. Hence, it has been deemed a pseudoscience.<sup>2</sup> Moreover, the rate of acupuncture-related adverse events as per a recent review is alarming, as more than 715 complications including about 50 acupuncture-related deaths were reported in 12 prospective studies.<sup>3</sup> Approximately one-fourth of these were traumatic and infectious complications, such as pneumothorax, compartment syndrome, deep venous thrombosis, and hepatitis B.<sup>3</sup> These adverse events mostly occur at the site of the acupuncture needle and by the hands of inexperienced, improperly trained acupuncturists using improperly sterile needles and controversial techniques.<sup>4</sup> There are limited data on acupuncture-related cardiac complications, and particularly cases wherein the procedure is performed at a remote site from the heart.

## Methods

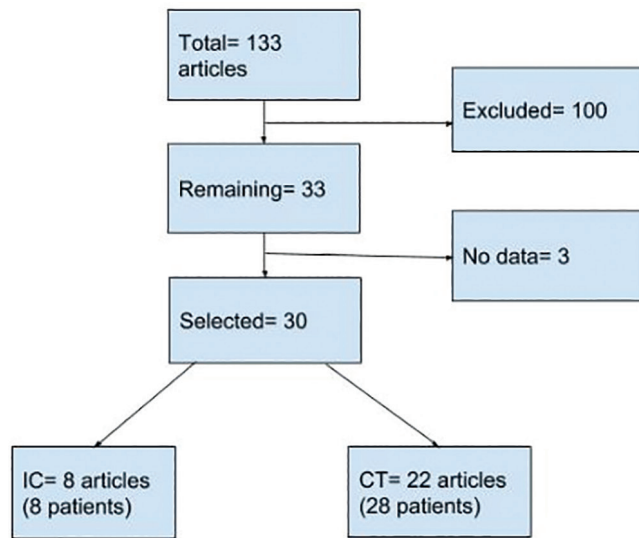
Two authors independently did a comprehensive literature search from inception until May 2018 using the standard

MeSH terms on four different databases (Embase, MedLine, Scopus, and Cochrane). There were no time or language restrictions placed. Different search terms like “acupuncture,” “cardiac tamponade,” “cardiac injury,” “heart injury,” “hemopericardium,” “pericardial effusion,” “cardiac infection,” and “infective endocarditis” were combined using different Boolean operators, and finally, the expected data from all selected materials were tabulated.

## Results

The initial search revealed 133 articles; after reading the titles and abstracts for the relevance, a total of 100 items were excluded, three articles had insufficient data, and the remaining 30 articles were selected for data extraction. Of these, a total of 8 articles reported acupuncture-related infective cardiac complications, whereas 22 articles reported the incidence of cardiac tamponade (CT). In the articles describing CT, one included 9 patients; hence, a total of 28 patients with CT were reported (Figure 1). The analysis was performed using SPSS Statistics, version 22 (IBM).

The mean age of the patients with any cardiac complication was 49.9 years (range, 9–83 years). The ages of patients suffering from infective complications ranged from 15–61 years, whereas the age in patients who developed CT ranged from 9–84 years. About 42.1% of male patients and 57.9% of female patients had a successful recovery. Three articles did



**FIGURE 1.** Flow chart of selected studies on acupuncture-related infective endocarditis [IC] and cardiac tamponade [CT].

not provide data on gender, and so gender distribution could not be determined. About 77% of all cardiac complications were CTs, while 23% of the post-acupuncture complications were infection related, with infective endocarditis (IE) the most common (6 cases), as well as infected myxoma (1 case), and purulent pericardial effusion (1 case). The incidence of endocarditis was more common in women ( $n = 6$ ; 75%) than men ( $n = 2$ ; 25%). All infective cardiac complications presented with fever and constitutional symptoms, such as malaise, rigors, and vomiting ( $n = 8$ ; 100%).

Interestingly, for IE, about 60% of patients had the earlobe as the acupuncture site involved, while 40% of patients (including ours) had knee, ankle, or hip joints as the acupuncture site. Patients who developed CT mostly received acupuncture at the level of the fourth intercostal space on the sternum. The most common risk factor for IE was rheumatic heart disease ( $n = 3/8$ ; 37.5%) followed by smoking ( $n = 2/8$ ; 25%). Other risk factors like atopic eczema, hypertension, rheumatoid arthritis, and trauma also seemed to be contributing factors toward developing IE.

Individuals who developed CT had various comorbid conditions (mostly chronic pain,  $n = 7/20$ ; 35%). The highest number of patients who survived the cardiac complications had acupuncture performed for non-specific pain and were having associated rheumatic heart disease (17.6% of the patients survived). Other patients who survived the cardiac complications had acupuncture performed for atopic eczema, epigastric pain, traumatic pain, and back pain (each reported only once; 5.88% each). The mortality rate was high among females (71.4% vs 28.6% in males; Pearson's Chi-square = 0.529; likelihood ratio = 0.524). Of all patients who died of acupuncture-related cardiac complications (33.3%), rheumatoid arthritis, fibromyalgia, arthralgias, and intercostal

neuralgia were found to be the reason for acupuncture. There was no significant difference in the mortality rate between the patients who had post-acupuncture CT vs those who had an infective cardiac complication (Pearson's Chi-square = 0.559; likelihood ratio = 0.553), but the weighted percentage of death was very high among CT patients (80%) in contrast to patients with infective complications post acupuncture. Interestingly, one case report mentioned an elderly patient presenting with unusual symptoms of myalgias who was diagnosed with methicillin-sensitive *Staphylococcus aureus* pericardial abscess after acupuncture at the knee joint (Table 1).

## Discussion

The most commonly reported cardiac complications related to acupuncture are CT and IE.<sup>3</sup> CT occurs as a result of direct needle trauma to the overlying pericardium due to improper techniques. The factors that seemed to contribute to the development of IE were lack of antibiotic prophylaxis, unsterilized procedures, migration of skin flora into the heart tissues, and history of rheumatic heart disease and smoking.<sup>3</sup> A prior history of rheumatic heart disease is a direct contributing factor toward developing IE.<sup>31</sup> The common presenting complaint of IE was high-grade fever, chills, and (rarely) skin stigmata, with or without joint pain. In patients with CT, the typical presentation was classical clinical triad hypotension, elevated jugular venous pressure, and muffled heart sounds.<sup>5-10</sup>

This review showed a different mechanism of IE, namely, the migration of skin flora into the blood and all the way to the endocardium, causing vegetations or direct infiltration of organisms into the heart tissues.<sup>5,8</sup> Interestingly, patients with valvular abnormalities like rheumatic heart disease were very prone to have IE and patients who had acupuncture performed on the earlobes had a high incidence of IE.<sup>6,8,9,10</sup> These findings could be hypothesized by the proximity of the earlobes to the heart muscles and gravity-directed increased venous drainage into the heart with respect to the lower limbs. CT, however, occurred due to direct cardiac injury by the needle. In some cases, the needle penetrated the sternal foramen, whereas it was caused by small needle fragments in other cases that involved the Japanese style of acupuncture.<sup>19,21</sup> Interestingly, there was a single case reported in which CT occurred years after acupuncture due to needle migration.<sup>15</sup> These complications can be diagnosed easily with echocardiography, which can reveal thickening and calcifications of the valve leaflets in the case of endocarditis and hemopericardium or pericardial effusion can be visualized in cases of CT.<sup>32,33</sup>

It is evident that IE and CT are easily preventable by avoiding unsterilized techniques and deliberate needle embedding or deep penetration of the needle into the skin, respectively.<sup>34</sup> However, treatment post complication can range from broad-spectrum intravenous antibiotics to surgical

Table 1. Acupuncture-related cardiac tamponade and infectious cardiac complications.

No.	Type of Complication	Study / Country / Year	Age (years)	Sex	Acupuncture Reason	Outcome
1	cardiac tamponade	Ye et al <sup>4</sup> / China / 1956	9	m	N/A	death
2	cardiac tamponade	Schiff et al <sup>5</sup> / United States / 1965	82	m	N/A	death
3	cardiac tamponade	Nieda et al <sup>6</sup> / Japan / 1973	55	m	chronic epigastric pain	recovery
4	cardiac tamponade	Hasegawa et al <sup>7</sup> / Japan / 1991	52	m	N/A	recovery
5	cardiac tamponade	Dwivedi et al <sup>8</sup> / India / 1991	40	m	pain	recovery
6	cardiac tamponade	Liu et al <sup>9</sup> / China / 1993	9	N/A	various patients	death
7	cardiac tamponade	Halvorsen et al <sup>10</sup> / Norway / 1995	40	f	fibromyalgia	death
8	cardiac tamponade	Kataoka et al <sup>11</sup> / Japan / 1997	69	f	back pain	recovery
9	cardiac tamponade	Kirchgatterer et al <sup>12</sup> / Austria / 2000	83	f	N/A	recovery
10	cardiac tamponade	Peuker et al <sup>13</sup> / France and Canada / 2001	N/A	N/A	N/A	death
11	cardiac tamponade	Peuker et al <sup>13</sup> / France and Canada / 2001	N/A	N/A	N/A	death
12	cardiac tamponade	Xie et al <sup>14</sup> / China / 2003	35	f	intercostal neuralgia	death
13	cardiac tamponade	Canta net al <sup>15</sup> / France / 2003	25	f	N/A	recovery
14	cardiac tamponade	Park et al <sup>16</sup> / Korea / 2005	49	f	pain	recovery
15	cardiac tamponade	Gen et al <sup>17</sup> / China / 2005	58	m	chronic bronchitis	recovery
16	cardiac tamponade	Luo et al <sup>18</sup> / China / 2006	40	m	esophagitis	recovery
17	cardiac tamponade	Huo et al <sup>19</sup> / China / 2007	39	m	dyspnea	recovery
18	cardiac tamponade	Zhu et al <sup>20</sup> / China / 2008	44	f	diabetes	death
19	cardiac tamponade	Kim et al <sup>21</sup> / Korea / 2011	54	f	N/A	recovery
20	cardiac tamponade	Her et al <sup>22</sup> / Korea / 2013	62	m	cerebral infarction, atrial fibrillation	recovery
21	cardiac tamponade	Chun et al <sup>23</sup> / Korea / 2014	48	f	N/A	recovery
22	cardiac tamponade	Wigger et al <sup>24</sup> / Switzerland / 2015	51	f	chronic pain	recovery
23	infective endocarditis	Buckley et al <sup>25</sup> / United Kingdom / 2011	15	m	arthralgia	recovery
24	infected left atrial myxoma	Uchino et al <sup>26</sup> / Japan / 2002	47	f	ear	recovery
25	infective endocarditis	Spelman et al <sup>27</sup> / Australia / 1993	61	f	rheumatoid arthritis	death
26	infective endocarditis	Scheel et al <sup>28</sup> / Norway / 1991	59	f	rheumatic arthritis	recovery
27	infective endocarditis	Lee et al <sup>29</sup> / United Kingdom / 1984	56	f	rheumatic arthritis	recovery
28	infective endocarditis	Jeffreys et al <sup>30</sup> / United Kingdom / 1983	57	f	rheumatic arthritis	recovery
29	infective endocarditis	Leavy et al <sup>31</sup> / United States / 2002	33	m	rheumatic arthritis	recovery
30	pericardial abscess	Han et al <sup>32</sup> / Korea / 2012	72	f	arthralgia	death

f = female; m = male; N/A = not applicable.

drainage of an abscess in cases of IE.<sup>3</sup> It could be a reasonable argument that serious post-acupuncture complications are rarities, and that the procedure is safe and beneficial, yet this should not distract us from our responsibility to highlight these life-threatening complications and to try to make the procedure even safer.<sup>35</sup>

**Study limitations.** There are certain limitations to this study. First, we could only include case reports because there has been no randomized controlled study or large-scale observational study on cardiac complications post acupuncture. Second, there was no quality assessment of the included studies

because they were case reports; hence, the possibility of publication bias could not be excluded.

## Conclusion

Acupuncture does pose some serious threats, especially when attempted by inexperienced personnel. The proper education of both individuals seeking acupuncture and acupuncturists is necessary to avoid inserting the needle into some high-risk regions, and the use of appropriate sterile techniques may decrease the incidence of these complications. Moreover, a risk-benefit evaluation is essential before

adopting acupuncture as a therapy; for example, it is wise to avoid this procedure in cases of mild pain that could easily be managed with medications. The risk of developing CT can be minimized. People opting for acupuncture should be questioned regarding any prior history of valvular heart disease to reduce the risk of developing infections. No guidelines exist to recommend antibiotic prophylaxis for patients with heart valve issues seeking acupuncture, and this issue may require further study.

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Disclosure: The authors have completed and returned the ICMJE Form for Disclosure of Potential Conflicts of Interest. The authors report no conflicts of interest regarding the content herein.

Manuscript submitted November 15, 2018, provisional acceptance given November 22, 2018, final version accepted December 5, 2018.

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