

## Commentary on the Role of Antibiotics for Renal Tumor Ablation

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### Article Info

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### Introduction

The use of prophylactic antibiotics for ablation of renal tumors varies and is a practice that has little to no supporting evidence<sup>1-3</sup>. Prior studies on renal tumor ablation typically do not mention whether antibiotics were used or not, and in those that do, a wide variety of antibiotic choices has been described<sup>3</sup>. Despite renal tumor ablation becoming a common practice in the early 2000s<sup>4,5</sup>, currently there is no consensus on the use of routine antibiotic prophylaxis for tumor ablation, per the Society of Interventional Radiology (SIR)<sup>6</sup>. The Cardiovascular and Interventional Radiological Society of Europe (CIRSE) guidelines for percutaneous ablation of small renal cell carcinomas recommend prophylactic antibiotics in patients with specific risk factors: diabetes, patients with a ureteric stent, and patients with an ileal loop diversion<sup>7</sup>. The purpose of this paper is to examine the recent article entitled, “Infectious Outcomes from Renal Tumor Ablation: Prophylactic Antibiotics or Not?”, and to discuss the current and recent literature regarding the topic.

Excessive antibiotic administration in the US has contributed greatly to the problem of antibiotic resistance<sup>8</sup>. The global crisis<sup>8</sup> of antibiotic resistance necessitates efforts to eliminate unnecessary antibiotic use, particularly in newer fields in which guidelines are in early development. With general increased emphasis on minimally invasive and cost-effective procedures by physicians, the number of renal tumor ablations likely will continue to rise each year<sup>9</sup>, and a standard of practice regarding the use of prophylactic antibiotics would be welcome.

### The Background for Prophylactic Antibiotics

Ever since the discovery of early antibiotics like penicillin in the 1940s, it has been theorized that their use could prevent surgical site infections (SSI). SSI are those infections that arise from or near surgery sites within the first 30 days following operations<sup>10</sup>. SSIs have long been among the most common and most costly infections in healthcare<sup>11</sup>. Subsequent studies supported this concept, with penicillin alone showing a remarkable decrease of infection rates post-abdominal surgery, from 25% to 10%<sup>10</sup>. A decrease in post-operative infections meant decrease in length of hospital stay and cost; thus, these findings led to a dramatic increase in antibiotic use.

The early decades of perioperative prophylactic antibiotic use were erratic, largely left to the discretion of individual surgeons. While early researchers such as Altemeier recognized the dangers of widespread prophylactic antibiotic use as early as 1955<sup>12</sup>, it was not until the 1970s that antibiotic resistance was widely recognized as a growing and potentially disastrous problem<sup>13</sup>. Each antimicrobial

agent invariably yielded resistance, and it became clear that resistance was unavoidable with increased use. While resistance rose, development of novel antibiotics slowed<sup>8</sup>, and this forced physicians to become more selective in their usage. Additionally, increasing rates of *Clostridium difficile* disease associated with prophylactic antibiotic use was recognized as another major problem<sup>14</sup>.

Researchers recognized that the cost of prophylactic antibiotic use could not be ignored, and had to be weighed carefully with its proven benefits. In 1984, Dellinger, et al. detailed evidence-based guidelines to attempt to standardize prophylactic antibiotic regimen, dosage, and rationale, based on the specific surgical procedure. They declared, "The cost of and morbidity attributable to postoperative wound infections should be weighed against the cost and potential morbidity associated with excessive use of antimicrobial agents<sup>13</sup>."

Prophylactic antibiotics have been shown to be most beneficial when used prior to operations with high risk of infection<sup>15</sup>. Additionally, a significant benefit also occurs when they are used before operations with low risk of infection, but when an infection would result in devastating consequences for a patient, such as when a prosthetic joint is placed<sup>15</sup>. Efforts to minimize duration of use, improve timing, and limit use of broad spectrum antibiotics have shaped current guidelines<sup>16</sup>. Despite the development of novel, broad-spectrum antibiotics in recent years, data cannot support the notion that these "agents with broad in vitro antibacterial activity" result in lower rate of post-surgical infections<sup>17</sup>, and thus cefazolin is recommended for most procedures<sup>16</sup>.

### Prophylactic Antibiotics in Renal Ablation

While different in nature, parallels between the approach to prophylactic antibiotics prior to renal tumor ablation and pre-operative antibiotics are obvious. A similar approach to cost-benefit is appropriate, i.e. "cost of and morbidity attributable to" post-ablation infections, "should be weighed against the cost and potential morbidity associated with excessive use of antimicrobial agents." The recent article, "Infectious Outcomes from Renal Tumor Ablation: Prophylactic Antibiotics or Not?" sheds light on renal tumor ablation infection risk and reported use of prophylactic antibiotics<sup>3</sup>.

That review examined fifty-one articles (49 retrospective and 2 prospective studies), published between January 2010 and April 2016, that tracked potentially infectious complications following renal tumor ablation. The number of patients from these studies totaled 6,952. Data were recorded regarding ablation modality (radiofrequency, cryoablation, or microwave ablation), whether the approach was percutaneous or laparoscopic, whether or not prophylactic antibiotics were

used, and if so, the regimen, as well as potentially infectious complications (including fever). Of these 51 articles, only four (373 patients) reported use of prophylactic antibiotics, and each of these articles described a different antibiotic regimen that included cefazolin, cefotaxime, amoxicillin plus clavulanate, and ciprofloxacin. It is uncertain whether patients from the remaining 47 articles (6,579 patients) received prophylactic antibiotics, as use was not mentioned in those articles. The data revealed that potentially infectious complications were rare, occurring in 74/6,952 patients (1.06%) when fever was included, and even rare-29/6,952 (0.42%) when fever was excluded. The most common potentially infectious complication was fever; it was found in 45/74 of the possible complications. However, fever was only present in 0.6% of total patients, and fever could be from a variety of sources besides infection, such as atelectasis, post-ablation syndrome (self-limited inflammatory reaction to the ablation), and post-anesthesia. Fever was more frequent following the laparoscopic approach compared to the percutaneous approach. The next most commonly reported complication was abscess, found in 0.2% of patients, followed by urinary tract infection, urosepsis, wound infection, cellulitis, and pneumonia. Excluding fever, infectious complication rates were similar regardless of ablation modality or approach. The authors concluded that while the lack of reporting of prophylactic antibiotic use limited their study, infectious complications following renal tumor ablation are rare. Their review concluded that the data do not support the routine use of prophylactic antibiotics for renal tumor ablation.

Current literature supports this conclusion. The most recent practice parameter update from the SIR concludes that infection following renal tumor ablation is rare (<1%)<sup>16</sup>. Their current recommendations as of November 2018, states that routine prophylaxis is not indicated unless there is colonized urothelium<sup>16</sup>. The CIRSE recommendations are similar, stating that the risk of infectious complications following renal tumor ablation is very low, and antibiotic use is left up to the physician's preference.

Neither the American Urological Association (AUA) nor the European Association of Urology (EAU) comment on the use of prophylactic antibiotics prior to ablation. The AUA, however, in their most recent guidelines regarding antimicrobial prophylaxis for urologic procedures, states that recent studies of clean urologic procedures including "minimally invasive surgery (MIS) for renal and adrenal tumors" have not shown a significant benefit from prophylactic antibiotic use<sup>18</sup>. They recommend selective use of these agents with high-risk individuals<sup>18</sup>. The AUA does recommend a single dose periprocedural antibiotic when performing a nephrectomy, similar to other surgical interventions<sup>18</sup>. While currently there is no consensus on

prophylactic antibiotic use due to the lack of randomized control trials, the data are consistent that infectious complications following renal tumor ablation are rare, and thus routine antibiotic use is not indicated.

### Non-renal Ablation

Percutaneous tumor ablation started with hepatic tumors and was expanded to other organs, including kidneys for renal tumor ablation<sup>19</sup>. The SIR states that infectious complications such as hepatic abscess following hepatic tumor ablation is rare (0.8%), but due to the large amount of necrotic material that can result from ablation and can act as a nidus for infection during percutaneous intervention, they state that it is reasonable for physicians to administer a single antibiotic that targets skin flora as a precaution<sup>16</sup>. Additionally, they state that current literature has shown increased risk of infection following hepatic tumor ablation in patients with a history of biliary colonization, and some studies have shown that antibiotic administration in these cases is associated with a decreased incidence of infectious complications<sup>20,21</sup>.

Additionally, there is no consensus on the use of prophylactic antibiotics for other solid-organ tumors, such as adrenal, lung, and bone tumors<sup>16</sup>. Along the lines of renal and hepatic tumor ablation, some authors recommend the use of antibiotics for solid-organ tumor ablation with the presumption that necrotic tissue poses a risk for infection<sup>22,23</sup>. These suggestions lack clear evidence; for example, the use of prophylactic antibiotics for lung tumor ablation has not been associated with decreased risk of infectious complications, such as abscess or pneumonia<sup>24</sup>.

### Conclusion

In summary, the risk of infectious complications following percutaneous renal tumor ablation is rare. The incidence of bacterial seeding from skin flora through percutaneous intervention appears uncommon in most solid organ tumor ablation. Studies have shown that prophylactic antibiotic use in this setting is uncommonly reported, and in the cases when it is reported, a wide variety of regimens exists. Given the current antibiotic resistance issue, it is essential for physicians to make evidence-based decisions about antibiotic administration, carefully weighing the costs and benefits. A prospective, randomized control study could more accurately determine the efficacy of prophylactic antibiotics prior to renal tumor ablation. However, even if a significant reduction of infections was found, the overall incidence of infection is still below <1% and therefore may not be cost-effective. The data from the review of this article and current literature do not support the routine use of prophylactic antibiotics for renal tumor ablation.

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