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# KANSAS JOURNAL *of* MEDICINE

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## *From the Editor*

### New and Improved *Kansas Journal of Medicine*: Perspective from the Editor-in-Chief

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Since its launch in 2007, the *Kansas Journal of Medicine* (KJM) has served as a platform for scholarly writing among medical learners, featuring articles primarily by Kansas authors, particularly junior faculty, residents, and students. Over the years, the journal has undergone several changes and is now archived in PubMed Central. However, there is always room for improvement, which is why I am pleased to share several important changes and enhancements to our journal that reflect our ongoing commitment to excellence and innovation in academic publishing.

**Introduction of Brief Reports.** We are excited to announce the creation of a new article type - Brief Reports. This format is designed for concise yet impactful studies that present significant findings in a succinct manner. These reports are evaluated using the same rigorous criteria as original research but can be smaller in scope and may be less generalizable to other settings. This submission type allows the editorial office to quickly and efficiently share important research by our trainees and junior faculty, ensuring timely communication of advancements to our readership.

**Implementation of Statement of Attestation.** To enhance the credibility and transparency of our published research, we have introduced a preparation and submission guideline called the Statement of Attestation from all authors. This statement affirms authors' careful review of the manuscript and endorse its content, serving as formal declarations of the accuracy and integrity of their work. This initiative underscores our dedication to maintaining the highest ethical standards in publishing.

**Improved Review Process.** We also have made improvements to our review process, including at least two reviewers - one of whom is an external reviewer - for each manuscript. Our new system includes streamlined submission protocols, enhanced reviewer guidelines, and a more efficient timeline for manuscript evaluations. These changes aim to provide authors with constructive feedback more promptly while maintaining the rigorous standards of peer review for which our journal is known.

**New and Modified Editorial Board.** We are proud to introduce our newly appointed and modified editorial board. These esteemed colleagues bring a wealth of expertise and fresh perspectives to our journal. Their diverse backgrounds and extensive experience are invaluable as we continue to elevate the quality and impact of our publications. The updated editorial board also play a crucial role in implementing our new initiatives and ensuring the highest standards of scholarship.

**Submitting Papers Rejected from Other Journals.** Over the years, KJM has sometimes been seen as a journal where manuscripts can be submitted after being rejected by other national journals. To address this, we have updated our policy on rejected manuscripts. While KJM will consider manuscripts that may have been rejected from other journals, we now require authors to provide this information, including reviewer comments and author responses, in their submission. Authors should clearly state in their cover letter that they are including these materials. Additionally, all submissions to KJM should adhere to the required elements outlined on our website (journals.ku.edu/kjm).

**Use of Artificial Intelligence.** Our journal has introduced a policy regarding the use of artificial intelligence (AI). While we encourage authors to use technology, our policy provides guidelines for the use of AI tools. Software using generative AI or machine learning (ML) is allowed. However, the journal does not permit including ML tools, such as ChatGPT, as authors. If such a tool is used to generate a manuscript, it must be disclosed. These tools often use existing text and may not effectively incorporate proper citations. Borrowing text without proper attribution constitutes plagiarism. Authors using an ML tool are responsible for citing previously published work accurately.

**Publication Schedule.** To maintain the relevance and impact of the journal, we have transitioned to a bi-monthly publication schedule, producing six issues per year. This change allows us to better serve our academic and clinical communities, uphold our standards of excellence in scholarly publishing, and contribute to the ongoing dialogue that drives medical innovation and improves patient care.

These enhancements are part of our continuous effort to better serve our authors, reviewers, and readers. We believe these changes will foster greater innovation, transparency, and efficiency in the dissemination of scientific knowledge.

Thank you for your continued support and contribution to KJM. We look forward to receiving your submissions and to the continued success of our publication.

# Vaginal Cuff Dehiscence after Robotic Hysterectomy in Endometrial Cancer vs. Non-Cancer Patients

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## ABSTRACT

**Introduction.** Vaginal cuff dehiscence (CD) after hysterectomy is a rare but serious complication of robotic-assisted laparoscopic total hysterectomy (RLTH). The authors of this study aimed to compare the incidence and risk factors of CD following RLTH among patients with and without endometrial cancer.

**Methods.** This retrospective study included women aged 18 years or older who underwent RLTH by two surgeons at a single institution from 2013 to 2018. Patients with conversion to laparotomy, recent chemotherapy or radiation, or non-uterine malignancy were excluded. Data were abstracted from medical records.

**Results.** Of 950 patients meeting inclusion criteria, 50.7% had endometrial cancer. CD was reported in 2.5% of all patients. While adjusting for cancer status, age, sexual activity after surgery, distance from home to location of surgery, and time interval from surgery to loss to follow-up, obese patients were 25.1% less likely than non-obese patients to experience CD (62.5 vs. 37.5, p = 0.01). Surgeon A had a 2.8 times higher CD rate than surgeon B (70.8 vs. 29.2, p = 0.03). No other factors predicted CD.

**Conclusions.** Endometrial cancer patients were not at greater risk of experiencing CD compared to non-cancer patients. Surgeon differences and body mass index (BMI) were associated with CD risk, with normal BMI patients at higher risk. ***Kans J Med 2024;17:74-77***

## INTRODUCTION

In gynecologic oncology, endometrial cancer is the most common indication for robotic-assisted laparoscopic total hysterectomy (RLTH).[1] Vaginal cuff complications following RLTH, including dehiscence, have been reported.[2,3] Vaginal cuff dehiscence (CD) is the separation of the anterior and posterior fibromuscular edges of the vaginal cuff, with or without bowel evisceration.[3] CD has an incidence of 0.4% to 4.1% following RLTH, a considerable increase compared to other methods of total hysterectomy.[2-7]

Variances in vaginal cuff closure, including suture technique, material, and approach, may alter the risk of CD following RLTH.[5,8-10] Risk of CD following RLTH also is associated with vaginal atrophy, tobacco use, obesity, and/or diabetes.[11] Post-operative trauma to the healing cuff, such as sexual activity, also is known to be a potential precipitating factor for CD.[10-12] Risk of CD following RLTH may also be associated with malignancy, specifically endometrial cancer.[13] This study sought to determine if there was a difference in the incidence and risk factors of CD following RLTH among patients with endometrial cancer compared to patients without endometrial cancer.

## METHODS

Authors of this retrospective review utilized data abstracted from electronic medical records at a single institution. This study was approved by The University of Kansas Medical Center Institutional Review Board (IRB). Patients 18 years or older who had undergone RLTH (CPT codes: 58570, 58571, 58572, 58573) performed by two gynecologic oncology surgeons from 2013 through 2018 were included in this study. Patients were excluded if they had undergone chemotherapy and/or radiation within a year before or after the RLTH, had primary malignancies other than endometrial cancer, or had conversion to laparotomy during the RLTH.

Demographics, comorbidities, cancer status, cancer descriptors, RLTH surgical information, CD occurrence, precipitating events, dehiscence characteristics, and method of repair were abstracted and managed using REDCap® electronic data capture tools hosted at the University of Kansas Medical Center.[14,15]

**Statistical Analysis.** SAS version 9.4 (SAS Int. Inc., Cary, NC) was used for data analysis. CD incidence after RLTH among endometrial cancer patients was 1.3%[16] and among patients without endometrial cancer was 0.85%.[17] With these percentages, the power was calculated to be 0.859, indicating a required sample size of 1,000 patients. Two proportions using the Pearson's Chi-square approach were used, and normal approximation was assumed to approximate the sampling distribution of the difference in proportions between the two groups. This method assumed that the sampling distribution of the difference in proportions followed a normal distribution for the large sample size. The overall number of participants in the final analysis fell short of the intended sample size of 1,000 patients. Consequently, the power analysis was re-evaluated retrospectively using the sample size of 950, resulting in a power of 0.84, which met the statistical criteria for acceptability.

Frequencies, proportion, means, and standard deviations were calculated. Associations between nominal or categorical variables were tested using Pearson's Chi-square, likelihood ratio Chi-square, and Fisher's exact test. The Mann-Whitney U test assessed differences in dehiscence levels over the surgery to follow-up time interval. In cases of non-normal distribution, the rank transformation approach combined ranking and general linear modeling. Univariate and multiple logistic regression models employing Firth's bias-reduction penalized maximum likelihood estimation and explored the association between CD and explanatory variables. Fisher scoring, based on the expected information matrix, was used as an iterative algorithm. Statistical significance was set at p < 0.05 for all tests.

## RESULTS

Out of 1,208 patients, 21.3% (n = 258) were excluded from the study. The remaining 950 patients were divided into two groups: those with endometrial cancer (50.7%, n = 482) and those without cancer (49.3%, n = 468).

The patients' ages ranged from 23 to 95 years, with an average age of 56 years (SD = 13.3; Table 1). Most patients were White or Caucasian (87.6%, n = 832), post-menopausal (65.4%, n = 600), and lived less than 50 miles from the surgery location (59.8%, n = 569). Among patients with endometrial cancer, the majority had Stage IA (80.1%, n = 386), Grade 1 disease (67.0%, n = 323), had an endometrioid histologic type (90.9%, n = 438), and received pelvic lymph node dissection at the time of surgery (75.1%, n = 362).

**Table 1. Patient demographics and clinical characteristics.**

| Characteristics | Endometrial Cancer Patients n = 482 | Non-Cancer Patients n = 468 | Chi-Square (df) | P-Value |
|---|---|---|---|---|
| Age | | | 230.5 (1) | <0.001 |
| 18 to 49 Years | 48 (10) | 263 (56.2) | | |
| 50 Years or Older | 434 (90) | 205 (43.8) | | |
| Race | | | 10 (3) | 0.020 |
| White or Caucasian | 437 (90.6) | 395 (84.4) | | |
| Black or African American | 13 (2.7) | 22 (4.7) | | |
| Asian American | 4 (0.8) | 12 (2.6) | | |
| Other | 28 (5.8) | 39 (8.3) | | |
| Ethnicity | | | 3.8 (2) | 0.150 |
| Hispanic or Latino | 24 (5) | 30 (6.5) | | |
| Not Hispanic or Latino | 457 (95) | 433 (93.5) | | |
| Body Mass Index (BMI) | | | 75.8 (4) | <0.001 |
| Less than or equal to 18.5 | 1 (0.2) | 13 (2.8) | | |
| 18.6 to 24.9 | 46 (9.5) | 107 (22.9) | | |
| 25 to 29.9 | 77 (16) | 116 (24.8) | | |
| 30 to 39.9 | 194 (40.3) | 151 (32.3) | | |
| Greater Than or Equal to 40 | 164 (34) | 81 (17.3) | | |
| Menopause Status (n = 917) | | | 193.5 (1) | <0.001 |
| Postmenopausal | 407 (86.8) | 193 (43.1) | | |
| Premenopausal | 62 (13.2) | 255 (56.9) | | |
| Parity (n = 948) | | | 7.8 (4) | 0.100 |
| 0 | 113 (23.4) | 95 (20.4) | | |
| 1 | 53 (11) | 70 (15) | | |
| 2 | 136 (28.2) | 151 (32.4) | | |
| 3 | 110 (22.8) | 98 (21) | | |
| 4 or more | 70 (14.5) | 52 (11.2) | | |
| Hypertension Status | | | 55.5 (1) | <0.001 |
| No | 214 (44.4) | 320 (68.4) | | |
| Yes | 268 (55.6) | 148 (31.6) | | |

**Table 1. Patient demographics and clinical characteristics.** *cont.*

| Characteristics | Endometrial Cancer Patients n = 482 | Non-Cancer Patients n = 468 | Chi-Square (df) | P-Value |
|---|---|---|---|---|
| Diabetes | | | 37.2 (3) | <0.001 |
| Not Diabetic | 361 (74.9) | 418 (89.3) | | |
| Diabetes Type 1 | 2 (0.4) | 4 (0.9) | | |
| Diabetes Type 2 | 116 (24.1) | 44 (9.4) | | |
| Diabetes Type Unknown | 3 (0.6) | 2 (0.4) | | |
| Smoking Status | | | 18.3 (3) | <0.001 |
| Never Smoker | 362 (75.9) | 306 (66.8) | | |
| Current Smoker (at time of surgery) | 31 (6.5) | 65 (14.2) | | |
| Former Smoker | 84 (17.6) | 87 (19) | | |
| Distance from Home to Surgical Center (n = 946) | | | 7.8 (3) | 0.049 |
| Less Than 50 Miles | 274 (57) | 295 (63.4) | | |
| 50 to 99 Miles | 77 (16) | 80 (17.2) | | |
| 100 to 199 Miles | 97 (20.2) | 67 (14.4) | | |
| 200 miles or more | 33 (6.9) | 23 (5) | | |
| Surgeon | | | 0.7 (1) | 0.400 |
| Surgeon A | 245 (50.8) | 225 (48.1%) | | |
| Surgeon B | 237 (49.2) | 243 (51.9%) | | |
| Endometrial Cancer Stage | | | | |
| Stage IA | 386 (80.1) | | | |
| Stage IB | 75 (15.6) | | | |
| Stage II | 3 (0.6) | | | |
| Stage III | 15 (3.1) | | | |
| Stage IV | 2 (0.4) | | | |
| Unknown/Not Recorded | 1 (0.2) | | | |
| Endometrial Cancer Grade | | | | |
| Grade 1 | 323 (67) | | | |
| Grade 2 | 114 (23.7) | | | |
| Grade 3 | 43 (8.9) | | | |
| Unknown/Not Recorded | 2 (0.4) | | | |
| Endometrial Histologic Type | | | | |
| Carcinosarcoma | 2 (0.4) | | | |
| Endometrioid | 438 (90.9) | | | |
| Serous | 24 (5) | | | |
| More Than One | 12 (2.5) | | | |
| Other | 5 (1) | | | |
| Unknown/Not Recorded | 1 (0.2) | | | |
| Pelvic Lymph Node Dissection Performed at Surgery | | | | |
| No | 120 (24.9) | | | |
| Yes | 362 (75.1) | | | |

Data are presented as n (%), unless otherwise indicated. Some totals may not add up to 100% due to missing values.

The suture type most frequently used for vaginal cuff closure by both surgeons was Polyglactin 9/10 (92.0%, n = 874). The most common suture technique for vaginal cuff closure (95.9%, n = 911) involved two sutures running from lateral to midline.

More non-cancer patients (57.1%) reported being sexually active after surgery than cancer patients (32.5%; $\chi^2$ [2, N = 947] = 51.5, p < 0.001). A greater proportion of non-cancer patients (63.4%) lived

less than 50 miles from the surgery location compared to endometrial cancer patients (57.0%; $\chi^2$ [3, N = 946] = 7.8, p = 0.049). There was no significant difference in the number of endometrial cancer patients treated by surgeon A compared to surgeon B.

CD occurred in 2.53% (n = 24) of all patients. The incidence of CD among endometrial cancer patients was 1.9% (n = 9) and 3.2% (n = 15) among non-cancer patients ($\chi^2$ [1, N = 768] = 2.2, p = 0.139). Among patients diagnosed with CD, 29.2% (n = 7) reported a precipitating event, with intercourse being the most reported trigger (85.7%, n = 6). Of all CD occurrences, 16.7% (n = 4) involved overt evisceration of intra-abdominal contents, while 83.3% (n = 20) were classified as occult separation of the vaginal cuff, defined as a visibly or palpably thin membrane with peritoneal fluid or abdominal contents pushing against it, with or without a surrounding ring of scar tissue.

On average, patients were lost to follow-up 284 days after surgery. Patients living closer to the surgery location were lost to follow-up after a longer period (F[3, 942] = 3.5, p = 0.015) than those living further away. Patients living 50 miles or less were lost to follow-up 320 days after surgery, compared to 181 days for patients living 200 or more miles away. Endometrial cancer patients were lost to follow-up an average of 422 days post-surgery, compared to 140 days for non-cancer patients.

Among patients with CD, the condition was reported an average of 138 days post-surgery, with a median of 58 days post-surgery. Lastly, patients with CD were lost to follow-up 532 days post-surgery on average.

As shown in Table 2, CD was more common among patients with a normal BMI (41.7%) compared to overweight (25.0%) and obese patients (29.2%; $\chi^2$ [2, N = 768] = 13.2, p = 0.001). Of the 24 cases of CD, 70.8% (n = 17) were patients of surgeon A ($\chi^2$ [1, N = 768] = 6.7, p = 0.010).

**Table 2. Testing association between CD and patient factors.**

| Patient Factors | Cuff Dehiscence | | | |
|---|---|---|---|---|
| | No | Yes | Chi-Square (df) | P-value |
| **Age** | | | 0.7 (1) | 0.390 |
| 18 to 49 years | 247 (33.2) | 10 (41.7) | | |
| 50 years or older | 497 (66.8) | 14 (58.3) | | |
| **BMI** | | | 13.2 (3) | 0.001 |
| Less than or equal to 18.5 | 11 (1.5) | 1 (4.2) | | |
| 18.5 to 24.9 | 114 (15.3) | 10 (41.7) | | |
| 25 to 29.9 | 154 (20.7) | 6 (25) | | |
| Greater than or equal to 30 | 465 (62.5) | 7 (29.2) | | |
| **Diabetes** | | | 3.1 (1) | 0.080 |
| Patients with diabetes | 134 (18) | 1 (4.2) | | |
| Patients without diabetes | 610 (82) | 23 (95.8) | | |
| **Sexually active after surgery** | | | | 0.100 |
| No | 357 (54.7) | 9 (37.5) | | |
| Yes | 296 (45.3) | 15 (62.5) | | |
| **Surgeon** | | | 6.7 (1) | 0.010 |
| A | 329 (44.2) | 17 (70.8) | | |
| B | 415 (55.8) | 7 (29.2) | | |
| **Distance from home to surgery location** | | | 1.7 (1) | 0.190 |
| Less than 50 miles | 459 (61.7) | 18 (75) | | |
| Greater than or equal to 50 miles | 285 (38.3) | 6 (25) | | |

**Table 2. Testing association between CD and patient factors.** *cont.*

| Patient Factors | Cuff Dehiscence | | | |
|---|---|---|---|---|
| | No | Yes | Chi-Square (df) | P-value |
| **Patient type** | | | 2.2 (1) | 0.140 |
| Endometrial cancer patient | 393 (52.8) | 9 (37.5) | | |
| Non-cancer patient | 351 (47.2) | 15 (62.5) | | |

Data are presented as n (%).

While controlling for other predictor variables, Table 3 illustrates that obese patients were 25.1% less likely than patients with a normal BMI to experience CD (p = 0.011). Additionally, CD was 2.8 times more likely to be reported when surgery was performed by surgeon A compared to surgeon B (p = 0.027). The remaining predictors in the model (cancer status, age, sexual activity after surgery, distance from home to the surgery location, and time interval from surgery to loss to follow-up) were not associated with CD.

**Table 3. Logistic regression model of patient characteristic predictors of CD.**

| Predictors | Wald $\chi^2$ | P-value | Odds Ratio | 95% Confidence Interval |
|---|---|---|---|---|
| **Cancer status** | | | | |
| Endometrial cancer patient | 0.80 | 0.37 | 0.6 | (0.20, 1.83) |
| Non-cancer patient | (Ref) | (Ref) | (Ref) | (Ref) |
| **Age** | | | | |
| 50 years or older | 0.18 | 0.67 | 1.25 | (0.44, 3.57) |
| Younger than 50 years | (Ref) | (Ref) | (Ref) | (Ref) |
| **BMI** | | | | |
| Obese (greater than 30) | 6.49 | 0.01 | 0.25 | (0.09, 0.73) |
| Overweight (25 to 29.9) | 1.62 | 0.20 | 0.50 | (0.17, 1.46) |
| Underweight (less than 18.5) | 0.10 | 0.76 | 1.43 | (0.15, 13.20) |
| Normal weight (18.5 to 24.9) | (Ref) | (Ref) | (Ref) | (Ref) |
| **Surgeon** | | | | |
| Surgeon A | 4.87 | 0.03 | 2.80 | (1.12, 7.00) |
| Surgeon B | (Ref) | (Ref) | (Ref) | (Ref) |
| **Sexually active after surgery** | | | | |
| No | 0.93 | 0.33 | 0.64 | (0.25, 1.59) |
| Yes | (Ref) | (Ref) | (Ref) | (Ref) |
| **Distance** | | | | |
| Less than 50 miles | 0.67 | 0.41 | 1.50 | (0.57, 3.98) |
| 50 miles or more | (Ref) | (Ref) | (Ref) | (Ref) |
| **Time interval from surgery to loss to follow-up** | 3.43 | 0.06 | 1.00 | (0.99, 1.01) |

## DISCUSSION

Our study reports a 2.5% incidence of CD after RLTH, with incidences of 1.9% in endometrial cancer patients, and 3.2% in non-cancer patients. We found no increased risk of CD among endometrial cancer patients compared to non-cancer patients. Additionally, the current

study suggests that BMI and surgeon are the only variables associated with incidence of CD.

BMI was significantly associated with CD occurrence. Our study suggests obese patients were less likely to experience CD. These findings are supported by a prior study suggesting obesity to be a protective factor against CD after total laparoscopic hysterectomy or RLTH.[18] Intercourse was the inciting event in six of the seven cases with identifiable precipitating events. Donnellan et al.[18] hypothesized differences in positioning during intercourse may confer decreased force to the vaginal cuff among obese women compared to underweight or normal weight women. Therefore, women with a greater BMI may be at less of a risk for CD when resuming sexual activity after RLTH compared to women with a lesser BMI.

Both surgeons used the same suture material and nearly always used the same closure technique, suggesting there may have been a confounding factor. Some possible factors include patient demographics and sexual activity. Both surgeons used the same method of colpotomy for every surgery, so we were unable to determine if there was an association between CD and colpotomy technique.

**Limitations.** We excluded patients undergoing chemotherapy and/ or radiation within a year before or after RLTH to avoid the confounding negative effects that these treatments could potentially have on wound healing and tissue integrity.[13] However, by excluding these patients, we consequently excluded those with high stage/grade endometrial cancer, which may be a limitation of this study. Additionally, our sample size did not meet the original power calculation requirements. Retrospectively, however, our power was still statistically acceptable.

Because many patients in this study reside outside a 50-mile radius of the surgery center, we anticipated a risk of potentially missed CD diagnoses due to follow-up examinations at outside facilities. We attempted to account for this by considering this variable in our data analyses. Despite this, CD may be underreported in the group living further from the surgery center.

The timing and frequency of resumed post-operative intercourse could not be determined or controlled for, making it difficult to analyze how intercourse affected cuff healing in this study. This limitation could also explain the difference in CD rates between surgeons A and B.

Finally, endometrial cancer patients had a longer follow-up period than non-cancer patients, likely due to the necessity of surveillance for relapse or spread of disease, which would be unnecessary in patients with benign indications for RLTH. This could affect the reported incidence of CD in non-cancer patients, as CD is less likely to be seen and diagnosed in patients with limited follow-up. Similarly, we anticipate that there are patients who have undetected CD or may eventually experience symptoms of CD in the future.

## CONCLUSIONS

Our findings suggest that the identifiable incidence of CD after RLTH is 2.5%. Endometrial cancer patients were not at greater risk of experiencing CD compared to non-cancer patients. Surgeon differences and BMI were the only variables associated with the incidence of CD, with patients having a normal BMI being most likely to report experiencing this complication. Nearly one-third of patients with CD reported a precipitating event, with sexual intercourse being the most reported.

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# Evaluating the Long-Term Neurologic Sequelae Among Trauma Patients who Received Flexion-Extension Radiographs

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## ABSTRACT

**Introduction.** This study evaluated the presence of neurologic sequelae among trauma patients after flexion-extension (F/E) radiographs.

**Methods.** Authors of the study conducted a retrospective review of patients (age ≥ 14 years) with a Glasgow Coma Score of 15 who sustained a blunt traumatic injury and received F/E radiographs. Radiographic scans were defined as positive, negative, inconclusive, or incomplete. The neurologic status of each patient was assessed before and after the F/E radiographs, and at discharge and follow-up.

**Results.** Of the 501 patients included in the analysis, 84.6% (n = 424) had negative F/E radiographs, and 3.2% (n = 16) had positive F/E radiographs. Ten percent (n = 51) of patients had incomplete F/E radiographs, and 2.0% (n = 10) were inconclusive due to the inability to rule out a ligamentous injury. Three patients (0.6%) had MRI-confirmed ligamentous injuries, all of which had initial incomplete F/E radiographs due to pain. No patient had a documented neurological deficit before or after the F/E exam. Three patients with an initial negative F/E radiograph returned to the clinic with symptoms of neurologic sequelae. Two of these patients had symptom resolution with no further issues at future follow-up appointments. The third patient was found to have chronic neurologic symptoms after further evaluation.

**Conclusions.** The inclusion of F/E exams in cervical spine clearance protocols did not demonstrate any new long-term iatrogenic neurologic injuries. Consideration should be given to performing MRIs on patients with incomplete F/E radiographs that cannot rule out a ligamentous injury. ***Kans J Med 2024;17:78-80***

## INTRODUCTION

Cervical collars can be clinically cleared in patients with a suspected cervical spine injury who are awake, neurologically intact, and without neck pain or tenderness.[1] Those with pain or tenderness, a neurologic deficit, altered mental status, or distracting injury should be further evaluated with radiographic imaging.[1] For patients who have continued neck pain despite negative computed tomography (CT) results, the Eastern Association for the Surgery of Trauma (EAST) guidelines recommend either continuing the cervical collar until follow-up or removing it after additional imaging with either magnetic resonance imaging (MRI) or flexion-extension (F/E) radiographs.[1]

Cervical spine clearance protocols vary widely throughout the United States, with F/E examinations remaining a common method for evaluation.[2] Several studies have evaluated the use of F/E radiographs among blunt trauma patients, but few have addressed any long-term neurologic sequelae resulting from the F/E examination.[3-13] Therefore, this study evaluated the presence of neurologic sequelae among non-obtunded trauma patients who received F/E radiographs due to concern for a neck injury.

## METHODS

After obtaining Institutional Review Board (IRB) approval, a retrospective chart review was conducted at an American College of Surgeons-verified Level I Trauma Center. Blunt trauma patients 14 years or older with a Glasgow Coma Scale (GCS) of 15 who received F/E radiographs and had a negative cervical spine CT between January 1, 2007, and March 1, 2022, were identified. Data collected included demographics, mechanism of injury, injury severity, hospitalization details, disposition, and outcomes. Exclusion criteria included the presence of neurologic deficits concerning cervical spine involvement before F/E imaging and altered mental status during the performance of F/E radiographs.

The official radiographic results were used to define patient F/E results as positive, negative, inconclusive, or incomplete. A result was categorized as inconclusive when the official report could not specify how much spinal motion was present and/or provide definitive guidance on whether the motion was pathological. Reasons for an incomplete F/E examination included the inability to perform flexion or extension to a sufficient degree, obscuration of necessary visualization due to body habitus or overlying structures, or failure to produce visualization down to the C7/T1 junction.

To determine the neurologic sequelae of each patient, charts were thoroughly reviewed, and the neurologic status of each patient was assessed before and after the F/E exam. Discharge summaries also were reviewed to identify any reports of changes in neurologic status. Patients who presented for follow-up with symptoms concerning new-onset neurologic deficits were identified and further evaluated by chart review.

All data were entered and managed using Research Electronic Data Capture (REDCap®).[14,15] Continuous data are reported as the mean and standard deviation for normally distributed data and as the median with interquartile range for non-normally distributed data. Categorical data are presented as raw counts with percentages noted parenthetically. Data were collected, organized, and summarized using SAS 9.4 (SAS Institute).

## RESULTS

During the study period, a total of 506 trauma patients received F/E radiographs. Five patients were excluded due to positive cervical fracture CT results, neurologic deficits concerning cervical-spine involvement before F/E imaging and altered mental status during the performance of F/E imaging. Most patients were White (85.6%, n = 429) males (58.9%, n = 295) with an average age of 48 ± 21 years

(Table 1). Motor vehicle crashes (MVC; 38.3%, n = 192) were the most common mechanisms of injury, and patients were minimally injured with a mean ISS of 7 ± 6.3.

**Table 1. Patient demographics and injury characteristics.**

| Characteristics | All Patients ( N = 501) |
|---|---|
| Age, years, Mean (SD) | 48 ± 21 |
| Male sex, no. (%) | 295 (58.9%) |
| Caucasian, no. (%) | 429 (85.6%) |
| Mechanism of injury, no (%) | |
| Motor vehicle crash | 192 (38.3%) |
| Fall | 157 (31.3%) |
| Motorcycle crash | 52 (10.4%) |
| Vehicle versus pedestrian | 34 (6.8%) |
| Other | 66 (13.2%) |
| Injury Severity Score, Mean (SD) | 7 ± 6.3 |

SD = Standard deviation

Overall, 84.6% (n = 424) of F/E results were negative and 3.2% (n = 16) were positive (Table 2). Ten percent (10.2%, n = 51) of all patients were determined to have incomplete F/E results and 2.0% (n = 10) were inconclusive due to the lack of ability to rule out a ligamentous injury. Three patients (0.6%) had an MRI-confirmed ligamentous injury; all of which had an initial incomplete F/E exam due to pain restricting their range of motion.

**Table 2. Patient diagnostic findings.**

| Diagnostic Findings | All Patients ( N = 501) |
|---|---|
| Negative flexion-extension | 424 (84.6%) |
| Incomplete flexion-extension | 51 (10.2%) |
| Cleared clinically | 23/51 (45.1%) |
| Interpreted as negative | 15/51 (29.4%) |
| Cleared with MRI | 6/51(11.7%) |
| Discharged in collar | 4/51 (7.8%) |
| Positive MRI | 3/51 (5.9%) |
| Positive flexion-extension | 16 (3.2%) |
| Cleared with MRI | 14/16 (87.5%) |
| Cleared clinically | 1/16 (6.3%) |
| Discharged in collar | 1/16 (6.3%) |
| Inconclusive flexion-extension | 10 (2.0%) |
| Cleared with MRI | 4/10 (40.0%) |
| Discharged in collar | 3/10 (30.0%) |
| Interpreted as negative | 2/10 (20.0%) |
| Cleared clinically | 1/10 (10.0%) |

*Data are presented as the number (%)

Forty-one percent (n = 208) of patients required ICU admission, and 8% (n = 40) needed mechanical ventilation (Table 3). No patient had a documented neurologic sequela before or after the F/E exam. Most patients were discharged to home (77.8%, n = 390), and the mortality rate was 0.4% (n = 2). Of the 41.5% (n = 208) of patients who

returned for follow-up, three reported neurologic deficits that were not present before the F/E exam. None of these patients were found to have radiologic evidence of ligamentous injury, and all had an initial negative F/E radiograph.

### Cases: Possible New Neurologic Deficit After F/E Radiographs

Four days after discharge, Patient #1, who was discharged in a C-collar, was cleared with an MRI but experienced symptoms of paresthesia. These symptoms persisted for two weeks, waxing and waning until they completely resolved. Patient #2 had an extensive stay in both the hospital and a rehabilitation facility due to significant polytrauma. Following discharge, the patient experienced symptoms of bilateral paresthesia in their hands and feet. However, these symptoms had fully resolved at a subsequent two-week follow-up appointment. Patient #3 reported chronic paresthesia prior to discharge and at a two-week follow-up, but did not return for subsequent appointments.

**Table 3. Patient hospital outcomes.**

| Hospital Outcomes | All Patients ( N = 501) |
|---|---|
| Intensive Care Unit (ICU) admit, no. (%) | 208 (41.5%) |
| ICU length of stay, Mean (SD) | 1.2 ± 1.2 |
| Mechanical ventilation, no. (%) | 40 (8.0%) |
| Vent days, Mean (SD) | 2.6 ± 2.5 |
| Hospital length of stay, Mean (SD) | 3.4 ± 5.0 |
| Discharge disposition, no. (%) | |
| Home or self-care | 390 (77.8%) |
| Rehab, acute care, skilled nursing | 88 (17.6%) |
| Mortality, no. (%) | 2 (0.4%) |
| Neurologic symptoms, no. (%) | 3 (0.6%) |
| Before flexion-extension exam | 0 (0.0%) |
| After flexion-extension exam | 0 (0.0%) |
| At discharge | 1 (0.2%) |
| At follow-up | 3 (0.6%) |
| Returned for follow-up, no. (%) | 208 (41.5%) |

SD = Standard deviation

## DISCUSSION

Although there has been research as to whether F/E radiographs add clear benefit to patient care[4-9] and whether their performance and interpretation can be provider-dependent,[10,11] there are few studies evaluating the safety of performing F/E radiographs in the setting of trauma.[3,4] A secondary analysis of the NEXUS database noted that no harm was identified in the 10.5% of patients who obtained F/E radiographs.[4] An additional study by Brady et al.[3] investigated F/E radiograph utilization among 451 adult trauma patients and demonstrated that, despite F/E radiographs being performed without direct medical supervision, no patients had complications. However, these studies only noted that no complications or harm were identified in their study population and no patient follow-up was performed.

The current study adds to this literature as it is the first to investigate the neurologic status of each patient before and after an F/E exam, at discharge, and during follow-up. Study results identified three patients during the follow-up period who had symptoms of neurologic deficits after the F/E exam. Although the cause of the neurologic symptoms in these patients at follow-up is not fully understood, two patients had

complete resolution of symptoms within two to four weeks, and one patient was deemed to have chronic neurologic symptoms after further interview.

In the current study, three patients (0.6%) were found to have confirmed ligamentous injury on MRI. Interestingly, all three of these patients had incomplete F/E exams due to pain restricting their ability to perform the necessary movements. None of these patients required surgical intervention, and none suffered permanent neurologic sequelae. While this is a very small subset, it raises a concern about increasing the index of suspicion for ligamentous injury when significant discomfort is noted during the F/E examination.

Of the available clearance options by the EAST guidelines, F/E radiographs seem to provide a balance between safety and cost-effectiveness. Aside from F/E radiographs, other options include the patient being discharged with a cervical collar or being cleared by MRI.[1] Remaining in a cervical collar and returning for follow-up is often an inconvenient, costly, and unfollowed request of many patients. While MRIs provide the highest sensitivity for ligamentous injury, their routine use is costly, time-consuming, and likely impractical.

**Limitations.** This study had several limitations most notably that the data were collected retrospectively and from a single institution. Due to its retrospective nature, the authors were unable to accurately determine the cause of the two cases of new neurologic symptoms among the study population; however, as stated above, these symptoms resolved at follow-up. Also, the small size of our study may limit the generalizability of the results. There is also no standard protocol for the use of F/E exams, which are provider-dependent, and use varies among trauma physicians. Finally, there is a lack of long-term follow-up in a large portion of the included participants, however, it is assumed that these patients did not develop neurologic symptoms requiring a post-hospital visit.

## CONCLUSIONS

The inclusion of F/E exams in cervical spine clearance protocols did not demonstrate any new, long-term iatrogenic neurologic injuries in this study. F/E exams are a readily accessible and cost-effective method for evaluating cervical spine ligamentous injury, while also satisfying EAST guidelines. Consideration for MRI should be given to trauma patients with inconclusive F/E exams, particularly if they experience pain or discomfort during the F/E exam.

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## *Case Report*

# A Case of Extensive Cholangiocarcinoma Highlighting Challenges in Diagnosis and Treatment

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### INTRODUCTION

Cholangiocarcinoma is a rare malignant tumor with intra-hepatic, perihilar and distal hepatic variants.[1,2] Its incidence has gradually been increasing over the past few years and its diagnosis often carries a poor prognosis with an approximate 9% survival rate at five years.[3] Although a rare cancer, cholangiocarcinoma is the most common form of malignant biliary tumors.[1,4] The approach to treatment varies based on tumor type and stage.[5] Typically, treatment is surgical (potentially curative) for resectable disease and chemotherapy for advanced disease.[5,6] Although surgery is the only potentially curative approach, it does carry a high risk of recurrence.[7] Surgical intervention may also necessitate liver transplant.[1] In this article, we discuss a previously healthy patient who was diagnosed with a peculiar case of cholangiocarcinoma, highlighting the challenges faced in obtaining a correct diagnosis, and exploring various therapeutic options.

### CASE REPORT

A 58-year-old female, with no prior medical history or primary care physician, arrived at the hospital with severe right upper quadrant abdominal pain radiating to the back for the past four months and progressive jaundice over the last four days. She had also experienced diarrhea, nausea, and vomiting. Notably, she observed a grayish discoloration in her stools but denied the presence of blood. She attempted to alleviate her pain with acetaminophen and ibuprofen without success, and she noticed that eating exacerbated her discomfort.

Upon her arrival, she was hemodynamically stable and had no fever. Laboratory tests (Table 1) revealed elevated white blood cell count (WBC 16.8/uL), low hemoglobin (hgb 9.7 g/dl), increased mean corpuscular volume (MCV 100 fL), as well as elevated liver enzymes [Alanine transaminase (ALT) 65 U/L, Aspartate transaminase (AST) 139 U/L, Alkaline phosphatase (ALP) 421 U/L], total bilirubin (14.0 mg/dl), direct bilirubin (10.6 mg/dl), and indirect bilirubin (3.4 mg/dl). Additionally, she had an elevated international normalized ratio (INR) of 11.0. A computed tomography (CT) scan of her abdomen and pelvis identified a large, lobulated, and infiltrative hypo-enhancing mass that was enveloping the gallbladder, raising concerns of cholangiocarcinoma. This mass also extended into liver segments 4B and 5, encasing the right renal artery and compressing nearby structures, including the inferior vena cava and left renal vein. The patient was promptly initiated on ceftriaxone and metronidazole to address a potential biliary infection.

**Table 1. Laboratory findings.**

| Laboratory Test | Lab Value | Normal Range |
|---|---|---|
| White blood count | 16.8 /uL | 4.8 - 10.8 /uL |
| INR | 11.0 | 0.9 - 1.2 |
| Calcium | 12.6 mg/dL | 8.4 - 10.2 mg/dL |
| ALT | 65 U/L | 0 - 55 U/L |
| AST | 139 U/L | 5 - 34 U/L |
| ALP | 421 U/L | 40 - 150 U/L |
| Bilirubin (total) | 14.0 mg/dL | 0.2 - 1.2 mg/dL |
| Bilirubin (direct) | 10.6 mg/dL | 0.0 - 0.5 mg/dL |
| Bilirubin (indirect) | 3.4 mg/dL | 0.0 - 1.0 mg/dL |
| Ammonia | 72 umol/L | 18 - 72 umol/L |
| AFP | 1.1 ng/mL | 0 - 8.8 ng/mL |
| CEA | 3.5 ng/mL | 0 - 5.0 ng/mL |
| CA 19-9 | 571 U/mL | 0 - 37 U/mL |

Subsequent laboratory tests (Table 1) revealed normal levels of alpha fetoprotein (AFP) at 1.1 ng/mL and carcinoembryonic antigen (CEA) at 3.5 ng/mL along with a markedly elevated carbohydrate antigen 19-9 (CA 19-9) level of 571 U/mL. Magnetic resonance imaging (MRI) under sedation disclosed a large, infiltrative hepatobiliary mass highly suspicious for cholangiocarcinoma, measuring 11.0 x 10.6 x 16.9 cm (Figure 1). The mass was primarily located in segments 4B and 5 but extended into the caudate and medial margin of segment 6. It obstructed the common bile duct from the ampulla to the confluence, leading to a sudden cutoff of the right anterior and posterior, as well as left hepatic ducts, and moderate-to-severe intrahepatic biliary dilation. The mass also encased the gallbladder and compressed surrounding structures, including the suprarenal inferior vena cava, the first and second portions of the duodenum, and the colon at the hepatic flexure.
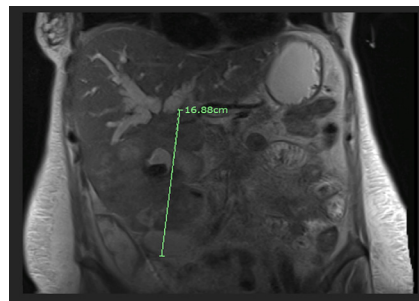


Figure 1. Coronal cross-sectional view of abdominal MRI showing a 16.88 cm mass suspicious of cholangiocarcinoma.

Given the extensive nature of the mass and the patient's persistently elevated bilirubin level, she was not deemed a surgical candidate, and percutaneous transhepatic cholangiogram (PTC) drainage was recommended over endoscopic retrograde cholangiopancreatography (ERCP) as an initial therapeutic option for biliary decompression. Interventional radiology was consulted to discuss PTC drain placement, but the patient and her family opted for hospice care, foregoing any further aggressive diagnostic or therapeutic interventions.

## DISCUSSION

Jaundice carries with it a wide range of differential diagnoses, both benign and malignant in nature. The constellation of clinical signs, labs, and pathology specimens can help guide physicians toward a specific diagnosis. Although cholangiocarcinoma is not common, it should be present on the differential diagnosis of patients with jaundice.

Bile ducts consist of intra-hepatic and extra-hepatic portions.[8] Intra-hepatic cholangiocarcinoma occurs within the liver, while perihilar and distal cholangiocarcinomas are located based on their relationship to the cystic duct.[9] Each subtype can present differently. Intra-hepatic cholangiocarcinoma often presents with constitutional symptoms like fatigue and night sweats, while perihilar and distal cholangiocarcinomas can cause signs of biliary obstruction, including jaundice and a cholestatic pattern on liver function tests, as seen in the patient discussed above.[9,10]

Diagnostic options for cholangiocarcinoma include CT and MRI for all subtypes, with magnetic resonance cholangiopancreatography, ERCP, and endoscopic ultrasound as additional modalities that can be used for extra-hepatic variants.[9] Treatment is usually surgical for resectable disease, with other options such as chemotherapy, chemoembolization, and radiofrequency ablation to be considered for unresectable disease depending on anatomic location.[9] Surgical resection has limitations in varying cases due to elevated bilirubin levels. Studies have shown that preoperative hyperbilirubinemia of greater than 6 mg/dL is strongly associated with post-operative complications including post-operative liver failure, intraoperative blood loss, heart failure, and even death.[11] It is worth noting that it can be difficult to distinguish between perihilar cholangiocarcinoma and gallbladder cancer pre-operatively.[12] While overall survival is similar between the two, three-year survival is usually lower for gallbladder cancer than for cholangiocarcinoma.[12] In our patient's case, given the size of the tumor, persistently elevated bilirubin levels, and overall prognosis, surgery was not a feasible option and hospice was the route taken.

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## Case Report

# Large Left Atrial Myxoma Discovered During Restaging of Breast Cancer

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## INTRODUCTION

Although extremely rare, myxomas are the most common cardiac tumors, accounting for more than 50% of all cases worldwide.[1,2] Despite being histologically benign, myxomas can have a wide spectrum of presentations based on their anatomic location, size, and mobility. They can mimic various heart conditions and present as cardiac insufficiency, valvular heart disease, syncope, peripheral embolic events, and systemic symptoms.[3] Transthoracic echocardiography (TTE) is the preferred imaging modality to visualize the tumor. If image quality is inadequate, transesophageal echocardiography (TEE) may be used for further evaluation. Multimodality imaging with cardiac computed tomography (CCT) and cardiac magnetic resonance (CMR) also is helpful for assessing anatomical and tissue features.[4] Given the risk of embolization, transvenous biopsy generally is not recommended, especially if the appearance is typical on imaging.[5]

An interesting aspect of cardiac myxomas is their infrequent occurrence as asymptomatic entities, often serendipitously identified through imaging studies. Typically known for causing noticeable symptoms, myxomas rarely manifest without any apparent signs.[6] We present a rare and interesting case of a large asymptomatic left atrial myxoma incidentally discovered during breast cancer restaging studies.

## CASE REPORT

We present the case of a 50-year-old previously healthy female with normal prior mammograms who initially presented to the oncology clinic after an abnormal mammogram and ultrasound of the left breast. Imaging revealed a 1 cm mass with a spiculated margin and calcifications. An ultrasound of the left breast showed an irregular mass with an irregular margin and an echogenic boundary, with no abnormalities seen in the left axilla. A breast biopsy later confirmed estrogen receptor (ER)/progesterone receptor (PR) positive, HER-2/neu negative, high Ki-67, invasive grade 2 ductal carcinoma of the breast, along with admixed lobular carcinoma in situ (LCIS).

Magnetic resonance imaging (MRI) of the breast showed a 0.9 cm x 1.1 cm x 1.4 cm irregular mass with a spiculated margin in the left breast and a fluid collection near the LCIS consistent with a hematoma. No other suspicious lesions were seen. Genetic testing with myRisk was negative for any deleterious mutations. The patient then underwent a bilateral mastectomy and left axillary lymph node dissection with immediate reconstruction. Pathology of the right breast was negative, but the left breast showed a 1.1 cm, grade 2, invasive ductal carcinoma with negative margins and foci of LCIS. While there was no evidence of lymphovascular invasion, six out of eight left axillary lymph nodes were positive for macrometastasis without evidence of extranodal extension.

Subsequent restaging studies with a computed tomography (CT) scan of the chest, abdomen, and pelvis, along with a whole-body bone scan, did not reveal any evidence of obvious metastatic disease. However, a left atrial mass measuring 2.4 x 2.4 cm was seen, suggestive of a myxoma or a large thrombus (Figure 1). A follow-up TEE showed a large mobile hyperechoic mass measuring 2.7 cm in the left atrium (Figure 2). The atrial mass subsequently was resected via median sternotomy, and pathology confirmed it to be a myxoma with negative margins. No additional intervention was required, and no intraoperative complications were noted. The patient then returned to the clinic to start neoadjuvant chemotherapy.



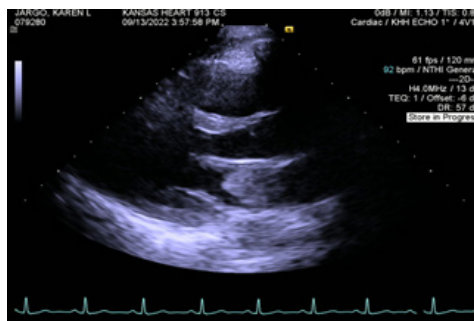Figure 1. Computed tomography scan of the chest showing left atrial mass.



Figure 2. Transesophageal echocardiogram showing the large mobile hyperechoic mass.

## DISCUSSION

Intracardiac masses are rare, with a few differential diagnoses including vegetations, thrombi, and tumors. Metastatic cardiac tumors are 20 to 40 times more common than primary tumors, with myxomas being the most common primary ones.[7] Left atrial myxomas have an incidence rate of 0.5 per million per year, with a peak incidence in women, primarily appearing between 30 and 60 years of age.[8]

Although mostly found in the left atrium near the fossa ovalis, these benign tumors can originate in any of the cardiac chambers and even valves. Therefore, the clinical manifestations vary widely depending on the size, location, and mobility of the mass. Myxomas can cause intracardiac blood flow obstruction, valvular dysfunction, local invasion, systemic embolization, and constitutional symptoms. Patients can present with malaise, fever, weight loss, dyspnea, orthopnea, arrhythmia, and heart failure. Despite the broad clinical spectrum, in some

rare instances, patients can remain asymptomatic, and the mass can be discovered incidentally on imaging.

Echocardiography remains the most common modality used to diagnose cardiac tumors given its high sensitivity and specificity.[9] This simple and non-invasive approach provides details of the tumor size, location, shape, attachment, and hemodynamic effect. Transesophageal echocardiography, as compared to transthoracic, can be more helpful in demonstrating the attachment site and detecting smaller tumors. A multimodal imaging approach with additional CT, MRI, and positron emission tomography (PET) scans provides more details about tissue composition and helps differentiate a myxoma from metastatic heart tumors.

In our case, the patient was completely asymptomatic and the intra-cardiac mass was not discovered until a repeat CT scan was performed for a restaging study. Surgical resection remains the treatment of choice for myxomas and is considered curative with an excellent short- and long-term prognosis. Given the possibility of embolization and other complications, surgery should be performed promptly after the diagnosis is made.[10] Recurrence after surgical excision is rare, with an overall risk of 1 to 3%, but regular follow-up with echocardiography is warranted.[11]

One syndrome that can explain the simultaneous presence of a breast mass with a cardiac myxoma is Carney Complex (CNC).[12] It is a multiple tumor syndrome characterized by cutaneous pigmented lesions, myxomas mainly in the heart, breast, and skin, as well as endocrine or neural tumors, among others. As part of CNC's main diagnostic criteria, breast myxomatosis and breast ductal adenomas are included; however, the involvement of breast cancer and other breast tumors is currently not clearly known. Hence, it is less likely for our patient to have a syndromic disease, making her case rare.[13]

## CONCLUSIONS

Cardiac tumors are rare, with myxomas being the most common benign primary cardiac tumors. Despite their benign nature, these tumors can present with a wide range of clinical symptoms depending on their size, location, and mobility. However, some patients can remain asymptomatic, and myxomas are sometimes detected incidentally during routine imaging for other reasons. Prompt surgical excision is recommended after diagnosis to avoid complications.

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## Case Report

# A Case Report of *Leclercia adecarboxylata* Pyogenic Arthritis

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### INTRODUCTION

*Leclercia adecarboxylata* (*L. adecarboxylata*) is recognized as an emerging human pathogen, with most documented infections reported in adults. It is known to cause bacteremia in immunocompromised individuals, and there are few reports of wound infections.[1] However, there is limited documentation of this organism in the pediatric population.

A report by Keyes et al.[2] in 2020 highlighted the scarcity of pediatric cases, revealing only nine cases in comparison to 44 adult cases in a PubMed search using the term *"Lecleria adecarboxylata."* Common infections in the pediatric population have been associated with injuries resulting in cellulitis and/or a retained foreign body. Our case report contributes to the understanding of this emerging pathogen, specifically in the context of septic arthritis following penetrating trauma from a tree branch. Arasu et al.[3] published two cases in 2022 describing *L. adecarboxylata* pyogenic arthritis of the knee in immune-competent children. In both cases, the children sustained injuries involving environmental elements, such as falling onto a tree stump or the edge of a wooden garden wall.[2,3] Surgical interventions, including arthroscopy and debridement, were employed to manage the infections. The literature review in that paper identified only three cases of *L. adecarboxylata* in immune-competent children, all of which presented with cutaneous wound infections managed through surgical debridement and antimicrobial therapy. The reported injuries included a paper laceration, a penetrating injury from environmental debris, and a penetrating injury from a tree trunk.

In expanding the range of reported cases in pediatric literature, our contribution involves detailing a case of pyogenic arthritis in an immune-competent child.

### CASE REPORT

A 5-year-old male, previously in good health, presented to the emergency department (ED) with complaints of right-sided knee pain and fever, leading to his admission to the pediatric unit. Six days prior to admission (PTA), he experienced a fall in a field near his home, resulting in a penetrating injury to his right knee with a stick that he subsequently removed. Five days PTA, he sought medical attention at his primary care physician's office due to persistent right knee pain and swelling, where a normal X-ray was obtained. In response to ongoing pain and swelling four days PTA, he was prescribed amoxicillin/clavulonic acid.

On the day of admission, the patient was brought to the ED with a temperature of 103.1°F, accompanied by persistent pain and swelling in his right knee. A blood culture was collected, and the laboratory work-up revealed a white blood cell count (WBC) of $6.5 \times 10^3/\mu L$ with 59% neutrophils and a platelet count of $327 \times 10^3/\mu L$. The C-reactive protein level was elevated at 46.0 mg/L. This clinical presentation raised concerns about a potential septic joint, a serious infection in the pediatric population. Orthopedics was consulted, and arthrocentesis was performed, yielding 5 mL of purulent fluid. The aspirated fluid was inoculated into a blood culture bottle and routine microbiology media. The patient was admitted to the pediatric floor and initiated on intravenous ceftriaxone and vancomycin.

The blood culture bottle inoculated with synovial fluid showed growth in the Enterobacterales order on a multiplex PCR panel. Subsequently, the patient was switched to intravenous meropenem for enhanced gram-negative coverage while awaiting final identification and susceptibilities. The culture ultimately identified *L. adecarboxylata*, susceptible to ampicillin, ampicillin/sulbactam, ceftriaxone, piperacillin/tazobactam, meropenem, and trimethoprim/sulfamethoxazole. A *Bacillus* species grew in the blood culture at 62 hours and was considered a contaminant.

Synovial fluid analysis, obtained during arthroscopic joint debridement and irrigation performed the day after admission, revealed a markedly elevated WBC count of $234 \times 10^3/\mu L$. Fragments of wood were removed during the procedure. The culture showed no growth on routine solid media. The patient clinically improved and was discharged on the fifth day of hospitalization with a prescription for oral amoxicillin/clavulonate to complete a four-week course of treatment.

### DISCUSSION

*L. adecarboxylata* is a motile, gram-negative bacillus belonging to the Enterobacteriaceae family and is infrequently isolated.[4] Widely distributed in nature, *L. adecarboxylata* can be found in water, food, soil, and other environmental sources.[5] It also is a part of the normal flora in human feces. Known to cause cellulitis, bacteremia, septic arthritis, and sepsis, the organism was initially named Escherichia adecarboxylata in 1962 but later reclassified as *L. adecarboxylata*.[6,7] Infections with *L. adecarboxylata* are more common in immunocompromised adults, with limited documented cases in the pediatric population including preterm infants in neonatal intensive care units (NICU).[8,9]

We presented a case involving a 5-year-old immunocompetent male who sustained a right knee injury with environmental contamination due to a foreign body penetrating the wound. The patient underwent a right knee aspirate, and the cultured synovial fluid was inoculated into a blood culture, resulting in the growth of *L. adecarboxylata*. Studies have indicated that inoculating a blood culture bottle with synovial fluid is more effective than conventional methods, leading to a higher recovery of pathogens.[10] The liquid blood culture medium, enriched for pathogen growth and containing saponin, aids in releasing phagocytosed microorganisms from white blood cells.[10] *L. adecarboxylata* typically demonstrates susceptibility to penicillin (ampicillin, amoxicillin/clavulanate, piperacillin/tazobactam), cephalosporins (ceftriaxone, cefepime), meropenem, fluoroquinolones (ciprofloxacin, ofloxacin), and trimethoprim-sulfamethoxazole.[11] While most cases of septic

arthritis in the pediatric population result from hematogenous spread, with *Staphylococcus aureus* being the most common organism, septic arthritis from penetrating wounds can have varied etiologies depending on the microbiology of the penetrating object, including bacterial, mycobacterial, and fungal pathogens.[12,13]

*L. adecarboxylata* should be included as a potential pathogen in the differential diagnosis of soft tissue and musculoskeletal infections in immune-competent children with a history of preceding injury. Additionally, consideration of *L. adecarboxylata* is warranted in patients with immune-compromised conditions, such as prematurity, malignancy, and chronic organ dysfunction. Notably, cases of multi-drug-resistant *L. adecarboxylata* have been reported, emphasizing the importance of tailoring antimicrobial therapy based on culture and susceptibility testing.

## CONCLUSIONS

*L. adecarboxylata* is an emerging pathogen with the potential to affect both pediatric and adult populations, spanning immune-competent and immune-suppressed individuals. This case report contributes to the scarce literature on *L. adecarboxylata* infections in the pediatric demographic, highlighting a preference for infections following injuries with lacerations or abrasions, particularly penetrating wounds. The case also underscores the effectiveness of inoculating synovial fluid into a blood culture bottle for improved pathogen recovery.

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## Commentary

# Ethical Obligation of Adequate Pain Management in Long Term Care Residents with Dementia

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Preserving personhood and its inherent dignity is a crucial challenge in dementia care. People living with dementia in long-term care facilities often experience many indignities and sufferings, some of which are beyond the control of caregivers, but some can be effectively mitigated. Pain always can be treated, and relieving suffering is a priority in any physician-patient relationship, particularly for this population. Adequate pain management is imperative for maintaining the dignity and quality of life for individuals with dementia.

People with dementia in long-term care settings are particularly vulnerable due to their inability to accurately and consistently express their experience of pain. To achieve optimal quality of life, individuals with dementia in nursing homes require special attention to appropriate pain assessment and treatment, which should include a full complement of non-pharmacologic and pharmacologic interventions. Careful monitoring and, when appropriate, reduction in the use of opioids is necessary, especially in the current health crisis marked by the widespread availability of opioids and increasing deaths due to opioid overuse. However, opioids remain an appropriate modality for pain control in many scenarios, including for nursing home residents with dementia. In this discussion, natural opiates and synthetic opioids are considered together as "opioids."

### Population Issues

By the time people require placement in a long-term care facility, they are generally elderly and have multiple chronic diseases, many of which cause pain. Pain decreases quality of life and is associated with problems such as depression and insomnia.[1] It also increases functional impairment in elderly people, further impacting their quality of life. In a systematic review, Cole et al.[1] found that the prevalence of current pain in nursing home residents ranged from 22% to 85%, and persistent pain ranged from 55.9% to 58.1%. The prevalence of pain of any description is 72% in persons over the age of 85.[2] This represents a very large number of elderly people experiencing significant pain, which negatively impacts their quality of life.

Older age also is associated with dementia, which affects 5% of patients over the age of 65 and over 50% of those over 90 years old.[2] Persons suffering from dementia often have behavioral and psychological symptoms, including disturbed perceptions, impaired thought processing, and cognitive communication disabilities.[1] Due to memory and language deficits, the ability to express pain may be substantially impaired, especially as dementia progresses.[1] Neural pathways affected by dementing processes, such as the plaques and tangles of Alzheimer's disease or ischemic areas due to vascular dementia, also are important in the perception and expression of pain.[2] Dementia appears to dysregulate pain processing, and different subtypes of dementia may alter pain processing in different ways.[3]

There is a substantial risk that pain is unrecognized and undertreated in these individuals. Therefore, determining which persons exhibiting dementia symptoms have pain, and the nature and severity of that pain, is a challenge that demands careful evaluation and treatment by caregivers.

### Expressions of Pain

Pain often underlies behavioral and psychological symptoms in people living with dementia, and agitated behavior or repetitive crying out may reflect pain.[2] If agitation or aggression is perceived as a mood or behavior problem, it may be treated with psychotropic medications. Tearful or anxious vocalizations of distress may be interpreted as depression or anxiety when they might represent expressions of pain. If physical comfort is adequately addressed through appropriate treatment of painful experiences, behaviors or mood disturbances may resolve, reducing the need for psychotropic medications such as benzodiazepines or antipsychotics.

The use of psychotropic medications increases the risk of sedation, falls, and other adverse effects, such as increased confusion and sedation.[4] Due to their high risk in elderly persons with dementia and their potential use as chemical restraints, they are tracked as quality measures in long-term care facilities. Opioids also carry risks of sedation, confusion, constipation, and falls, but appropriate treatment of pain is generally safer overall than the use of psychotropics.[5]

Long-term care facilities house concentrated populations of individuals who experience dementia and pain, and caregivers working in dementia care have access to tools and training to adequately assess and treat pain. Pain scales for people who are unable to verbally describe their pain, such as the Abbey Pain Scale[6] and the Pain Assessment in Advanced Dementia (PAINAD) scale,[7] use facial expressions, behaviors, vocalizations, and other physical changes to assess pain. Caregivers who routinely provide dementia care can be quite skilled at effectively assessing pain in people experiencing dementia, so expert attention to pain management can and should be expected in these settings.

### Use of Opioids for Pain

Some may argue that it is ethically preferable to avoid opioids in frail elderly nursing home residents due to the risks of side effects, addiction, overuse, and the potential diversion of opioids. Nonmaleficence calls for avoiding the potential for serious harm associated with opioid use. In recent years, much attention has been given to the "opioid epidemic," with opioid overdose becoming a leading cause of death, especially among young adults.[8] The 38% increase in opioid-involved deaths between 2019 and 2020[8] has sparked widespread conversation about the responsible use of opioid medications. Educational requirements have been added for opioid prescribers, and prescribing behaviors have been scrutinized.[9]

These efforts aim to reduce the supply of opioids and subsequent opioid-caused deaths, but they also create an environment where treating pain with opioids becomes more difficult, as less effective

medications are less controlled and have fewer barriers to prescribing. Death certificate data do not differentiate between opioid deaths caused by prescribed versus illicit opioids,[10] and complex prescribing rules do not account for the fact that the largest contributor to opioid-related deaths in the latest wave of increased overdoses is illicitly made fentanyl.[8] Opposition to opioid use is primarily based on concerns about misuse, addiction, and diversion. Nonmaleficence calls for prescribers to use measures that reduce these potential harms.[11] However, this renewed "war on drugs" has negatively impacted those who suffer from pain, whom health care professionals ethically are obligated to treat.[12] The negative impact especially is likely for patients who are less able to articulate their pain or advocate for relief from their suffering.

While outpatient settings are different from residential facilities, the availability of opioids in long-term care facilities comes with rational concern for abuse, addiction, and diversion. However, these concerns, although not eliminated, are substantially mitigated in long-term care settings due to strong policies and procedures dedicated to the accountability for the appropriate distribution of every dose of medication, especially controlled substances. Diversion of prescribed opioids, addiction, and abuse, though present in some nursing homes, are much less likely in this environment due to high levels of control and the ability to closely monitor patients for adverse events.[13] Long-term care facility leadership, especially medical directors, are tasked with participating in quality initiatives to avoid problems such as opioid diversion.[13]

### Treatment of Pain in Adults Experiencing Dementia

Appropriately treating pain in people experiencing dementia is vital and ethically necessary to protect their human dignity and promote quality of life. This is relevant not only to the individual but also at the societal level, as chronic pain further increases the psychiatric vulnerability of affected people.[14] Society benefits when all people are treated with dignity. Despite their risks, opioids may often be the safest and most effective pharmacologic approach to treating pain in elderly persons with dementia, especially those with conditions that limit the use of other classes of medications. Opioids can reduce human suffering for those with legitimate need, including patients enduring chronic pain that is severe, inadequately responsive to other therapies, or pain that adversely affects their function or quality of life.[10]

Nonopioid pain medications, such as non-steroidal anti-inflammatory drugs, carry higher risks for nephrotoxicity, gastrointestinal bleeding, and cardiac toxicity.[15] Caregivers usually can manage the side effects of opioids effectively, especially constipation. Additionally, the prompt availability of naloxone for use in the case of accidental overdose increases safety. In some cases, opioids provide the best pain relief, quality of life, and functioning,[9] and caregivers can mitigate many of the risks that those who argue against opioid pain relief often raise. Therefore, opioids should not be ignored as an important tool in the care of elderly people who experience pain while also managing dementia. Pain control is important for these vulnerable people for their dignity and quality of life.

Long-term care residents who live with dementia already are vulnerable due to their cognitive and physical function losses, exacerbated by communication deficits.[3] Unrelieved pain can severely impact quality of life and "may leave patients extremely vulnerable, speechless, changed,

and even destroyed."[11] Being particularly vulnerable, they deserve special attention for justice in the care they receive. There is an ethical responsibility to not leave in place pain and suffering beyond what is necessary.[11] Because cognitive impairment limits the ability to express one's narrative of pain, physicians and other caregivers must be especially attentive to carefully assessing the experiences of pain.[3]

Dementia robs people of much of their autonomy. Chronic pain also may decrease autonomy by reducing mobility and participation in activities. In appropriate cases, opioids can optimize whatever autonomy a person with dementia may continue to possess. Good pain management can improve functioning and mood, and treating pain may prevent behaviors that physicians might otherwise treat with psychotropic medications, which often present more and greater risks to elderly people. Quality care of those with dementia must appropriately consider pain, assess pain with tools effective for people unable to adequately verbalize their experience, and address pain using all necessary tools to maximize comfort and dignity.

Considering the ethical principle of beneficence, people dealing with dementia benefit from an improved quality of life when pain is managed. Nonmaleficence is addressed by closely monitoring potential risks and adverse effects of these medications. The application of justice calls for fair and equitable treatment for all patients.[9] People living with dementia require additional effort to ensure they are treated fairly with their pain appropriately managed. Modalities to address pain will include non-pharmacologic and pharmacologic interventions and should include opioids when clinically appropriate, rather than dismissing them due to the complicated nature of pain expression in this patient population. Quality care does not mean taking the path of least resistance due to a sociopolitical context that exists outside the individual patient or facility.

### CONCLUSIONS

While it is important to reduce opioid overdose deaths, it also is ethically imperative to appropriately treat pain in the vulnerable population of those experiencing dementia. People living with dementia suffer many losses in their sense of dignity due to their cognitive and physical debilities. Effectively treating their pain can restore an element of that dignity. Amid the opioid epidemic, there is a growing sense that our ethics of pain care have shifted from compassionate, rational use of opioids to a swift restriction of access for patients who genuinely need them.[6]

Failure to relieve the suffering of people in a position of vulnerability through effective pain management should be considered cruel, inhuman, and degrading,[6] and it flirts with violating the human right to realize a full life. Relief of pain is vital for quality of life and dignity. People experiencing dementia deserve dignity and respect, which includes adept attention to chronic pain. The use of opioids as valid tools in pain management is especially important for those made particularly vulnerable by their dementing illness.

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*Keywords: dementia, opioids, quality-of-life, dignity, long term care*

# The "Neglected aVR Lead": Kounis Syndrome of MINOCA Type, Severe Left Main or 3-Vessel Disease and Type A Dissecting Ascending Aortic Aneurysm

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A recent report in the *Kansas Journal of Medicine* described a case involving a 55-year-old man with a history of hypertension, hyperlipidemia, obesity class III, and tobacco use disorder.[1] He presented to the hospital with acute onset shortness of breath and left-sided chest discomfort, accompanied by diffuse skin redness and swelling of his hands and feet. Despite normal left ventricular ejection fraction and coronary angiography showing normal coronary arteries, his tryptase levels were elevated. The initial electrocardiogram showed diffuse ST segment depression with isolated ST segment elevation in augmented vector right (aVR) lead. The authors correctly diagnosed him with myocardial infarction with nonobstructive coronary arteries (MINOCA) of Kounis syndrome type I based on clinical and laboratory findings.[2]

The following should be taken into account in light of this case report:

1. In the described case,[1] the patient's ECG showed ST elevation in lead aVR, while most other leads displayed reciprocal ST depression. These findings are novel electrocardiographic expressions of Kounis syndrome, as reported by Kounis et al.[3] Lead aVR provides detailed information about the basal region of the septum and the right ventricle outflow tract, although it is often overlooked due to its location and the redundancy of information it provides compared to other leads.

2. Studies have shown that identifying severe left main or 3-vessel disease with 80% sensitivity and 93% specificity can be achieved by observing ST-segment elevation of more than 1.0 mm in lead aVR along with widespread ST-segment depression in inferolateral leads, as seen in this patient.[1,2,4] Urgent coronary angiography was performed, confirming normal coronary arteries associated with Type I Kounis syndrome. Type I Kounis syndrome is similar to MINOCA and describes the syndrome in patients with normal or nearly normal coronary arteries and no risk factors for coronary artery disease. It was initially described as coronary artery spasm.[5] This type is different from Type II or III, which are high-risk conditions requiring anti-platelet, aspirin, and heparin medication, along with immediate revascularization.

3. Conversely, a Type A dissecting aortic aneurysm, affecting the ascending aorta and compressing the left main artery and coronary ostia, can mimic myocardial infarction on an ECG but requires different treatment, including emergency surgery and avoidance of anti-platelets, aspirin, and heparin.[6] Transthoracic echocardiography can be used to detect the aortic aneurysm and resolve this diagnostic challenge.

To ensure the correct treatment for patients with chest pain and specific electrocardiographic changes, such as ST elevation in the aVR lead and reciprocal ST depression in other leads, as seen in the described case, it is important to consider diagnoses such as MINOCA, acute myocardial infarction, Kounis type I infarction, and aortic aneurysm.

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## Author Response

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We thank Nicholas G. Kounis, M.D., Ph.D. for his comment on our case report. While we largely agree with the outlined commentary, we believe the first point requires revision. The initial point may suggest that augmented vector right (aVR) elevation is specific to Kounis syndrome, which is not entirely accurate. Instead, isolated elevation in aVR with reciprocal changes should raise concern for left main or severe three-vessel disease pathology. The differential diagnosis could include acute coronary syndrome, aortic dissection, or other coronary pathology (such as Kounis syndrome), as well as global hypoperfusion (e.g., profound gastrointestinal bleed, pulmonary embolism, etc.), underlying cardiomyopathy, or underlying conduction abnormalities. Due to the potentially life-threatening nature of isolated aVR ST segment elevation, emergent evaluation is warranted.

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