Treatment of Acute and Recurrent Idiopathic Pericarditis
Leonard S. Lilly, MD

Case Presentation: A 56-year-old previously healthy man presented with 2 days of pleuritic left anterior chest pain, lessened by sitting forward. His examination was pertinent for low-grade fever (37.6°C), blood pressure 122/76 mm Hg without paradox, no jugular venous distension, clear lungs, and a 3-component pericardial friction rub. The ECG showed diffuse concave-upward ST-segment elevation and PR-segment depression in the inferior leads. The serum C-reactive protein level was 64 mg/L, and the cardiac troponin T was not elevated. Echocardiography showed normal left ventricular contractile function without wall motion abnormalities and no pericardial effusion. He was diagnosed with acute pericarditis, and the symptoms responded promptly to oral ibuprofen, continued for 2 weeks. Six weeks later, he redeveloped pleuritic chest pain and clinical and ECG findings identical to the initial presentation. His primary care physician asks for advice about appropriate therapy.

Background
Pericarditis accounts for 5% of emergency department visits for chest pain in the absence of myocardial infarction.1 In ≈80% of cases in developed countries, the cause of pericarditis is either postviral or “idiopathic,” in that it cannot be attributed to a specific condition.2,3 Because these 2 etiologies are clinically equivalent, the term idiopathic pericarditis will refer to both in this Clinician Update. Even when managed effectively, many patients with acute pericarditis present with 1 or more repeated episodes, termed recurrent pericarditis.4

Acute Pericarditis Management
Treatment of idiopathic pericarditis has long been empirical, because until recently, there have been few therapeutic trials addressing this condition. The European Society of Cardiology published the only treatment guideline for pericarditis almost a decade ago, and many of the recommendations were based on opinion because of the lack of available study evidence.5

Most patients with idiopathic pericarditis experience self-limited symptoms that improve spontaneously within days to weeks. More rapid relief can be achieved with pharmacological intervention, and stable patients can be managed in the outpatient setting. Hospitalization is recommended when features suggest nonidiopathic causes or herald hemodynamic compromise, including fever >38°C (>100.4°F), the subacute development of symptoms (characteristic of tuberculosis, neoplastic disease, uremia, or collagen vascular disorders), hypotension, jugular venous distension, a large pericardial effusion, or echocardiographic features of impending tamponade (Figure).5,6 Patients who are immunocompromised or are undergoing therapy with anticoagulants should also be observed initially in the hospital.5

Pharmacological Treatment
Effective agents include nonsteroidal anti-inflammatory drugs (NSAIDs), colchicine, and glucocorticoids. Concurrently, rest and avoidance of demanding physical activity help to minimize symptoms.

Nonsteroidal Anti-inflammatory Drugs
Aspirin and other NSAIDs are the first-line approach, based on clinical experience and observational reports.5,7 For example, in a 2004 study without a control group, outpatient therapy of uncomplicated pericarditis with aspirin relieved symptoms in 87% of 254 patients.5 Commonly used NSAID regimens are listed in the Table, with a recommended initial duration of 7 to 14 days, then treatment should be tapered until resolution of symptoms and improvement of acutely elevated serum inflammatory markers such as C-reactive protein and the erythrocyte...
sodium valproate (eg, phenytoin, phenobarbital, carbamazepine, and diltiazem, verapamil) or P-glycoprotein inhibitors (eg, cyclosporine). Moderate to strong inhibitors of CYP3A4 (eg, protease inhibitors, ketoconazole, fluconazole, erythromycin, diltiazem, verapamil) or P-glycoprotein inhibitors (eg, cyclosporine). Reduced dosage recommended for patients with advanced renal dysfunction or concurrent therapy with sodium valproate (eg, phenytoin, phenobarbital, carbamazepine, and diltiazem, verapamil) or P-glycoprotein inhibitors (eg, cyclosporine). Reduced dosage recommended for patients with advanced renal dysfunction or concurrent therapy with sodium valproate (eg, phenytoin, phenobarbital, carbamazepine, and diltiazem, verapamil) or P-glycoprotein inhibitors (eg, cyclosporine). Recommended in the 2004 European Society of Cardiology guidelines was colchicine as effective in recurrent pericarditis, and probably in acute pericarditis, for which it was assigned a class IIa indication. Subsequent prospective trials have provided additional evidence. In the open-label Colchicine in Acute Pericarditis (COPE) trial, 120 patients with a first episode of acute pericarditis were randomized to receive colchicine (0.5–1.0 mg daily for 3 months after 1–2 mg on the first day) plus aspirin (800 mg every 6–8 hours for 7–10 days, then tapered over 3–4 weeks) or aspirin alone. The rate of recurrent pericarditis over the subsequent 18 months was 32.3% in the aspirin group but only 10.7% in those who received colchicine plus aspirin (P=0.004). In addition, whereas 36.7% of patients in the aspirin group were still symptomatic at 72 hours after presentation, only 11.7% of those who also received colchicine remained symptomatic (P=0.003). Long-term low-dose colchicine is well tolerated, requiring discontinuation only rarely, primarily for diarrhea. Uncommon serious side effects, occurring primarily in patients with chronic renal insufficiency, include hepatic toxicity and myelosuppression. It is now common practice to include colchicine, in combination with an NSAID, as initial management of acute idiopathic pericarditis (Table). Glucocorticoids Steroid therapy has long been used to treat pericarditis because it induces prompt symptomatic relief; however, glucocorticoids should not be used as primary therapy in uncomplicated acute idiopathic pericarditis because of a high rate of relapse when the steroid is tapered or stopped. Glucocorticoids also appear to blunt the efficacy of colchicine in preventing recurrences. As a result, and owing to the side effects associated with long-term steroid therapy, glucocorticoids should only be prescribed to patients with idiopathic pericarditis who are refractory to treatment with, or intolerant of, an NSAID plus colchicine. When used, the prednisone dosage recommended in the 2004 European Society of Cardiology guidelines was a relatively high 1.0 mg·kg<sup>−1</sup>·d<sup>−1</sup> for 2 weeks with rapid tapering. A lower dosage (0.25–0.50 mg·kg<sup>−1</sup>·d<sup>−1</sup>) for 2 to 4 weeks, followed by slow tapering (Table) is effective and is associated with fewer relapses than the higher dosage.

Recurrent Pericarditis Management One or more recurrences arise in 15% to 30% of patients after an initial episode of acute pericarditis. These attacks can

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
<th>Duration of Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin</td>
<td>PO: 650–975 mg 3–4 times daily</td>
<td>1–2 wk (2–4 wk for recurrence)</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>PO: 400–800 mg 3 times daily</td>
<td>1–2 wk (2–4 wk for recurrence)</td>
</tr>
<tr>
<td>Indomethacin</td>
<td>PO: 50 mg 3 times daily</td>
<td>1–2 wk (2–4 wk for recurrence)</td>
</tr>
<tr>
<td>Ketorolac</td>
<td>IM: 30–60 mg once, or 15–30 mg every 6 h, or IV: 15–50 mg every 6 h</td>
<td>Should not exceed 5 days</td>
</tr>
<tr>
<td>Colchicine</td>
<td>0.5 or 0.6 mg 2 times daily*</td>
<td>Up to 3 mo (Up to 6 mo for recurrence)</td>
</tr>
<tr>
<td>Prednisone</td>
<td>0.25–0.5 mg·kg·d for 2 wk (2–4 wk for recurrence), then:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>At dose of:</td>
<td>Taper by†:</td>
</tr>
<tr>
<td></td>
<td>25–50 mg daily</td>
<td>5–10 mg every 1–2 wk</td>
</tr>
<tr>
<td></td>
<td>15–25 mg daily</td>
<td>2.5 mg every 2–4 wk</td>
</tr>
<tr>
<td></td>
<td>&lt;15 mg daily</td>
<td>1.0–2.5 mg every 2–6 wk</td>
</tr>
</tbody>
</table>

†As recommended by Imazio et al.

IM indicates intramuscular administration; IV, intravenous administration; and PO, by mouth.

Table. Pharmacological Treatment of Idiopathic Pericarditis

61% of those with symptoms who did not respond by 7 days of therapy were ultimately found not to have idiopathic pericarditis. Forty-three percent were determined to have autoimmune conditions, and 18% had tuberculosis. No single NSAID appears to be more effective than another in acute pericarditis, and in addition to oral agents, the parenteral NSAID ketorolac was shown to rapidly relieve symptoms in an uncontrolled trial. Aspirin is the preferred anti-inflammatory agent for patients with pericarditis after myocardial infarction because other NSAIDs have delayed infarct healing in animal models and are associated with an increased risk of future coronary events in this population.

A rapid response to aspirin or other NSAID therapy predicts a favorable prognosis in acute pericarditis and an unlikely progression to complications such as pericardial constriction. However, if chest discomfort or fever persists >1 week, or a new or larger pericardial effusion develops during therapy, a cause of pericarditis other than postviral/idiopathic should be suspected. In the report of 254 patients with acute pericarditis treated as outpatients with aspirin, patients with pericarditis after myocardial infarction because other NSAIDs have delayed infarct healing in animal models and are associated with an increased risk of future coronary events in this population.
Acute and Recurrent Idiopathic Pericarditis

repeat over extended periods of time and may lead to substantial disability. A first recurrence typically presents within 18 months, and findings are similar to the initial episode, including pleuritic chest pain, diffuse ST-segment elevations, a pericardial friction rub, and elevated serum markers of inflammation.

Pharmacological Treatment

Nonsteroidal Anti-inflammatory Drugs

In the absence of prospective trial evidence, aspirin or another NSAID should form the foundation of therapy for recurrences (Table). However, in contrast to the brief course of NSAID generally prescribed for an initial episode, a gradual tapering of the drug over 2 to 4 weeks after symptoms improve is recommended.

Colchicine

Use of colchicine in the COPE trial was associated with fewer initial pericarditis recurrences. Additionally, the Colchicine for Recurrent Pericarditis (CORE) trial randomized 84 patients who had already had a first recurrence to aspirin or aspirin plus colchicine. Compared with aspirin alone, the combination reduced the rate of additional recurrences by 50%.

Most recently, the double-blinded Colchicine for Recurrent Pericarditis (CORP) trial randomized 120 patients with a first recurrence to colchicine or placebo, in addition to aspirin or another NSAID. The rate of subsequent recurrence was 24% in those randomized to colchicine compared with 55% in the placebo group. In addition, the mean number of episodes was reduced and the time to next recurrence was lengthened. The duration of colchicine therapy in the CORE and CORP trials for recurrent pericarditis was 6 months.

Gluocorticoids

Symptoms of pericarditis recurrence respond promptly to glucocorticoid therapy. However, when administered in this situation, slow tapering and a prolonged course may be required to prevent recrudescent symptoms, with the potential for long-term steroid-associated side effects. Furthermore, the risk of additional recurrences of pericarditis is augmented by steroid use. Therefore, the consensus is to initially treat recurrent episodes of pericarditis with an NSAID plus colchicine and to prescribe glucocorticoids only for refractory cases.

Imazio and colleagues compared 2 steroid dosage intensities in recurrent pericarditis: Prednisone 0.2 to 0.5 mg·kg⁻¹·d⁻¹ versus the higher commonly used dose of 1.0 mg·kg⁻¹·d⁻¹ for 4 weeks, followed by a slow taper. The lower-dose regimen was effective, whereas the higher dosage was associated with more side effects and a greater number of subsequent pericarditis recurrences and hospitalizations. Thus, a now common approach to the use of steroids in patients with recurrent pericarditis whose symptoms are refractory to an NSAID plus colchicine is the lower-dose prednisone regimen listed in the Table. With prolonged corticosteroid

Clinical Presentation of Acute Pericarditis

- Pleuritic, positional chest pain
- Pericardial rub
- ECG abnormalities
- ± Pericardial effusion on imaging

High-risk Features

- Fever > 38°C
- Subacute onset
- Anticoagulated
- Immunocompromised
- Hypotension
- Jugular venous distension
- Large effusion

Admit to Hospital

Yes

Outpatient Management

- NSAID x 2 weeks
- ± Colchicine x 3 months

No

Figure. Initial triage pathway in acute pericarditis. NSAID indicates nonsteroidal anti-inflammatory drug.
use, osteoporosis prevention (eg, calcium, vitamin D, and bisphosphonates) should be considered.

A common cause of referral to specialized pericardial centers is the inability to taper glucocorticoid therapy below a certain dosage (typically \( \leq 15 \) mg of prednisone daily) without reemergence of symptoms, despite concurrent NSAID plus colchicine treatment. An often effective strategy in this circumstance is to resume the lowest prior steroid dosage that had controlled symptoms, and then taper it by only 1 to 2 mg every 2 to 4 weeks.\(^\text{19}\)

### Other Considerations

For refractory pericarditis despite NSAID, colchicine, and glucocorticoid therapies, improved symptoms have been reported in small numbers of patients with the use of immunosuppressive agents (azathioprine or methotrexate), intravenous immunoglobulin, and the interleukin-1\(\beta\) receptor antagonist anakinra.\(^\text{2}\) Finally, pericardiectomy can be undertaken.\(^\text{20}\) Case Presentation

(Continued)

The patient’s recurrent pericarditis was treated with ibuprofen 600 mg 3 times daily plus colchicine 0.6 mg twice daily. Ibuprofen was tapered off after 3 weeks, and the colchicine was continued for 6 months. After 1 additional year of follow-up, he has had no further symptoms of pericarditis.

### Summary

Appropriate therapy for acute idiopathic pericarditis is an NSAID for 2 weeks, and it is also reasonable to prescribe colchicine for up to 3 months (the duration used in clinical trials), especially to reduce the rate of recurrence. For initially refractory symptoms, the parenteral NSAID ketorolac may be beneficial. For recurrent episodes of pericarditis, treatment with an NSAID plus colchicine is recommended, but for a more prolonged course. During NSAID treatment, concurrent gastric protection therapy should be considered. Only for truly refractory cases should glucocorticoid therapy be used.

### Disclosures

None.

### References


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