Diagnosis and Management of Chronic Arthritis (Rheumatoid Arthritis)

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Abstract

Introduction: Rheumatoid arthritis is chronic inflammatory arthritis of unknown cause but is most often associated with smokers, trauma, infection and is more prevalent among women and those with family history. These factors trigger an autoimmune reaction which leads to synovial hypertrophy and chronic inflammatory state of joints involved. The diagnosis criteria involve at least involvement of one joint with swelling or with the involvement of multiple small joints the likelihood diagnosis increases. The investigation showed elevated C-reactive protein, erythrocyte sedimentation rate, presence of rheumatoid or anti-citrullinated protein antibody. Initial lab assessment includes complete blood picture, renal and hepatic function test for differential diagnosis. Management of rheumatoid arthritis is an integrated approach that includes both pharmacological and surgical treatment. Non-pharmacological therapy mainly includes diet counseling, exercise, massage, physical therapy. Medication may include various drugs such as NSAIDs, DMARD therapy, anti-rheumatic drugs, immunosuppressants, and corticosteroids. Surgical options include joint replacement.

Methodology: The review is a comprehensive research of PUBMED since the year 1998 to 2015.

Conclusion: Early diagnosis of rheumatoid arthritis helps in early treatment and prevents the further chronic state which may require surgical intervention. The goal of treatment is to reduce the pain and swelling and prevention of hindrance in usual daily personal activities. A combination of medications is used to control the disease but methotrexate is generally the first-line of the drug for rheumatoid arthritis. Other agents such as tumor necrosis factor inhibitors are also used as dual therapy. In case of severe joint damage whose symptoms cannot be medically managed are indicated for joint replacement.

Keywords: Rheumatoid Arthritis; Diagnosis; Medical Management; Surgical Intervention

Introduction

Rheumatoid arthritis is chronic inflammatory arthritis of unknown cause but is most often associated with smokers, trauma, infection and is more prevalent among women and those with family history. Rheumatoid arthritis is affecting 0.8% of the adult population globally. The usual presentation is in the third or fifth decade of life. Nearly 20% to 30% of persons with rheumatoid arthritis remain untreated leading to permanent disability within three years of diagnosis thus the disease has a high economic impact on the population [1,2].

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The basic pathogenesis of rheumatoid arthritis is characterized by inflammatory pathways which lead to a proliferation of synovial cells in joints, pannus formation, destruction of the underlying cartilage and bony erosions by excessive production of inflammatory mediators such as cytokines, tumor necrosis factor (TNF), interleukin-6 [3].

Methodology

Data sources and search items

We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1998 through February 2019. The following search items were used: Rheumatoid arthritis, chronic arthritis, diagnosis, medical management, surgical intervention.

Data extraction

Two reviewers have independently reviewed the studies, abstracted data, and disagreements were resolved by consensus. Studies were evaluated for quality and a review protocol was followed throughout.

Diagnosis

Diagnosis can be made with the typical presentation of diseases, which includes pain and stiffness in multiple joints. The most common sites involved are wrists, proximal interphalangeal joints, metacarpophalangeal joints. The clinical presentation is morning stiffness in joints lasting more than an hour, also suggestive of inflammatory etiology. A boggy swelling may be present with slight synovial thickening, palpable on examination. Systemic symptoms may include low-grade fever, fatigue, and weight loss [4].

Figure 1: Boggy swelling of joints involved, more prominent in the right hand [4].
Diagnostic criteria

There is no particular test for the diagnosis of rheumatoid arthritis. Till now the 1987 ACR revised criteria were applied for the diagnosis, but recently a new criterion has been developed for differentiating it from patients who may progress to rheumatoid arthritis (according to 1987 ACR criteria) from those who do not, the aim of which is to early identify the disease, prevention of early arthritic disease and identification of high risk early inflammatory arthritis for treatment. The new criteria (2010) has a rating on scale 0 - 10 points assigned in 4 different categories according to signs and symptoms such as joint involvement, duration of symptom, serology and acute phase reactants. The diagnosis is definite on a score of 6 or more points. The new criteria help in identifying patients with a relatively short duration of symptoms and thus benefitting the population with early institution of DMARD therapy [5,6].

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>No.</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint Involvement</td>
<td>• Medium to Large joints §</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>• Small joints ±</td>
<td>2 - 10</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>• Small joints ±</td>
<td>1 - 3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>• Small joints ±</td>
<td>4 - 10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>• Small joints ±</td>
<td>&gt; 10¥</td>
<td>5</td>
</tr>
<tr>
<td>Serology</td>
<td>• Not positive for either RF or anti-CCP</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>• At least one of these test positive at high titer*</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• At least one of these test positive at low titer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Duration of Symptoms</td>
<td>• +/- six weeks</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Acute-phase reactant</td>
<td>• Neither CRP or ESR is normal</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>• Abnormal CRP or ESR</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 1: Diagnostic criteria for rheumatoid arthritis.
Joint involvement refers to any swollen or tender joint on examination excluding digital interphalangeal, 1st carpometacarpal and 1st tarsometatarsal.
§: Shoulder, elbow, knee, ankle.
±: Metacarpophalangeal, proximal interphalangeal, 5th metatarsophalangeal, thumb interphalangeal and wrist joints.
¥: At least one of the joint involved must be small and others can include a combination of large additional small joints such as TMJ, acromioclavicular, sternoclavicular.

*Low titer - < three times the upper limit of normal > upper limit of normal.
**High titer - > three time the upper limit of normal.
± Large joints r.

Laboratory investigations

Abnormal values of different laboratory tests are the most significant and typical features for the diagnosis of rheumatoid. For the acute phase response, the acute phase reactants such as erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are proven to

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be the best diagnostic lab tests. Both verify the severity of inflammation in arthritis patients as well as useful in determining the effectiveness of treatment. The level of CRP is known to be substantially related to the severity of the disease [7,8].

Other tests include the detection of autoantibodies such as rheumatoid factor (RF) and anti-CCP is helpful in diagnosis. Anti-CCP antibody has similar sensitivity but greater specificity than RF for diagnosing the disease, while the combination of both increases the diagnostic specificity [9].

Synovial fluid analysis and arthrocentesis is another diagnosing tool for inflammatory arthritis as well as differentiating it from the non-inflammatory cause [10].

Imaging

A plain radiograph is the standard method of detecting anatomic changes in rheumatoid arthritis patients. Radiographic features such as bone erosion, subluxation, joint space narrowing occur at later stages. Synovitis is an early sign of rheumatoid arthritis and is a predictor of bone erosion, soft tissue swelling, and juxta-articular osteoporosis may be seen as other radiographic features but these findings are often not precise in many patients in conventional radiographs. Many times, radiographs fail to detect bone erosion which is one of the significant signs of rheumatoid arthritis [7].

Figure 2: (A) Single screen emulsion radiograph obscures a large erosion on the volar area of the third metacarpal joint because of the projection of overlying trabecular and cortical shadows while (B) Showing the occult erosion (arrow) in MRI [11].

In comparison to conventional radiographs, contrast sonography and MRI are more sensitive and detect erosion and other anatomic changes more precisely. Sonography is reliable in detecting rheumatoid arthritis at an early stage, it can detect a greater amount of erosion compared to radiographs. MRI facilitates in differentiating rheumatoid arthritis from other non-rheumatoid arthritis diseases [12].

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Treatment

As soon as the rheumatoid arthritis is diagnosed, treatment should begin according to guidelines but management of diseases is often influenced by the preference of the patient. Pregnant women need special consideration since many medications have deleterious effects on pregnancy and fetus. The main goal of therapy is to minimize the joint pain and swelling, prevent any bone deformity, deviation, bone erosions and thus maintaining the quality of life, extra-articular manifestation should be managed if present [14].

DMARDs

Disease-modifying antirheumatic drugs (DMARDs) are the main group of drug therapy. They can be biologic or non-biologic. Biologic DMARDs include monoclonal antibodies and recombinant receptors to block cytokines that promote inflammatory cascade which is responsible for rheumatoid arthritis. Combination therapy is proven to be more effective than monotherapy. Following drugs are commonly used [14,15]:

- **More commonly used:**
  - Methotrexate: Inhibit dihydrofolate reductase
  - Leflunomide: Inhibit pyrimidine synthesis
  - Hydroxychloroquine: Anti-malarial, blocks toll-like receptors
  - Sulfasalazine: Folate depletion
  - Minocycline: Antimicrobial.

- **Less commonly used:**
  - Gold sodium: Inhibit antigen processing, decreases cytokines.
  - Penicillamine: Chelates metal
  - Cyclophosphamide: Nitrogen mustard alkylating agent cross-links DNA

*Figure 3: (A) Ultrasound imaging of normal metacarpophalangeal joint (B) Arrow showing synovial hypertrophy (C) Joint with severe joint capsule distension [13].*
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- Cyclosporine: Calcineurin inhibitor, decreases interleukin.
- Biologic agents (anti-TNF agents)
  - Adalimumab
  - Certolizumab pegol
  - Etanercept
  - Golimumab.
- Other biologic agents
  - Abatacept
  - Anakinra
  - Rituximab
  - Tocilizumab.

NSAIDs and corticosteroids

To control pain and inflammation, NSAIDs and corticosteroids are often used in rheumatoid arthritis treatment. It can be given orally, intramuscular or intra-articular. These are given for short term management of rheumatoid arthritis. DMARDs are the choice of medication for treatment [14].

Surgical intervention

Surgery in patients with rheumatoid arthritis can relieve pain, deformity correction, and functional improvement. Various surgical procedures and techniques are available such as excisions, myofascial techniques, joint fusion, joint replacement, reconstruction. The time of surgery varies on the age of the patient, stage of the disease, location of the involved joint and severity and disability. Surgical intervention at initial stages may help enhance functional levels substantially. Any deformity in hand impedes the usual activity, the surgical treatment for hand and wrist joint are as follows [16]:

- Synovectomy
- Tenosynovectomy
- Tendon realignment
- Reconstructive surgery or arthroplasty
- Arthrodesis.

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Joint replacement

Hip and knee are the most frequently replaced joints. Joint replacement is suggested when the joint is severely damaged and symptoms are poorly controlled by medical management. The long-term prognosis is good [17].

Physical exercise

According to a study physical exercise in a group of arthritic patients improved the quality of life and muscle strength in the patient. There is no effect of exercises and training programs on the activity of diseases, pain and radiographic joint damage but it is shown to improve the range of motion [19].

<table>
<thead>
<tr>
<th>Cardiac</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Accelerated atherosclerosis</td>
<td>Leading of cause of death in patients with rheumatoid arthritis</td>
</tr>
<tr>
<td>• Pericarditis</td>
<td>Present in 30 - 50% of patients with rheumatoid arthritis but rarely leads to tamponade</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eye</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Episcleritis/scleritis</td>
<td>The acute, red, painful eye may occur in less than 1% of patients.</td>
</tr>
<tr>
<td>• Keratoconjunctivitis sicca</td>
<td>Secondary Sjogren syndrome, dry mouth may also occur.</td>
</tr>
<tr>
<td>• Peripheral ulcerative colitis</td>
<td>A more severe form of scleritis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hematologic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Amyloidosis</td>
<td>Caused by chronic inflammation</td>
</tr>
<tr>
<td>• Felty syndrome</td>
<td>Splenomegaly, neutropenia, and thrombocytopenia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nervous System</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cervical myelopathy</td>
<td>Caused by subluxation of the C1-C2 cervical vertebrae and can be seen on a flexion-extension radiograph.</td>
</tr>
<tr>
<td>• Neuropathy</td>
<td>Carpal tunnel, mono neuritis multiplex (foot drop)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pulmonary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Caplan syndrome</td>
<td>Nodules and pneumoconiosis.</td>
</tr>
<tr>
<td>• Interstitial lung disease</td>
<td>This may resemble bronchiolitis obliterans with organizing pneumonia, the patient may present with pulmonary arterial hypertension.</td>
</tr>
<tr>
<td>• Pleural effusion</td>
<td>Exudative effusion with a low glucose level.</td>
</tr>
<tr>
<td>• Pulmonary nodules</td>
<td>May be asymptomatic.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skin</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Rheumatoid nodules</td>
<td>Located on pressure areas and is firm or rubbery.</td>
</tr>
<tr>
<td>• Vasculitis</td>
<td>Its rare but severe cases occur with rheumatoid arthritis and cause increased mortality.</td>
</tr>
</tbody>
</table>

**Table 2:** Extra-articular manifestation of rheumatoid arthritis [4].

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Conclusion

Rheumatoid arthritis is a chronic inflammatory arthritis result in progressive destruction of the synovial joint which may be irreversible. This permanent destruction and deformity in joint may lead to disability, unemployment decrease in quality of life and societal participation and ultimately reducing life expectancy thus a proper early diagnosis is essential and improves the efficacy of treatment. Laboratory diagnosis along with imaging is useful in determining the definitive rheumatoid arthritis. Appropriate treatment includes DMARDs as the first line of pharmacological treatment along with NSAIDs and corticosteroids, also, to prevent worsening of the disease. Surgical intervention is indicated in severely damaged cases.

Bibliography

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