Chondrosarcoma: What You Need to Know

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Outline

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1 What is chondrosarcoma?

The Mayo Clinic defines it as ***"…a rare type of cancer that usually begins in the bones but can sometimes occur in the soft tissue near bones"***

- When faced with the possibility of a diagnosis of this type of rare cancer, it can feel very overwhelming. Having to research and learn details about chondrosarcoma, all while evaluating treatment options, locations and specialists is an enormous undertaking. Once you've been diagnosed, you will need to think about treatment. The most common treatment for chondrosarcoma is the surgical removal of the tumor.
- The goal of this publication is to help those facing such a diagnosis understand more about it, as well as to provide information about the medical decisions that will need to be made. This includes the steps to take to obtain a full and proper diagnosis, as well as what to expect after an initial diagnosis.
- As with many cancers, chondrosarcoma has various sub-types. Some are benign and others are very aggressive. Chondrosarcoma is classified by its level of severity and specific location within the body. Many cases occur in the limbs such as legs or arms, but it can occur in the spine, at the base of the skull and at other locations in the body.
- There is no known way to prevent chondrosarcoma. People with uncommon bone-related conditions may be more likely to develop chondrosarcoma. Also, some scientists have noted a connection between chondrosarcoma and injury in the affected area while others think there is a hereditary connection. At this point there is no definitive answer to the origin of chondrosarcoma.

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2 Initial Symptoms

Chondrosarcoma is often first detected with X-rays and CT or MRI scans. Its symptoms are usually pain and swelling of a specific bone or joint area. To get a proper diagnosis, a tissue or bone biopsy must be done and evaluated by a pathologist to verify whether the swelling is a bone cancer tumor. Preferably the pathologist specializes in diagnosing bone and soft tissue cancers.

- **Initial symptoms of chondrosarcoma may include:**
  - Large mass on the affected bone.
  - Feeling of pressure around the mass.
  - Pain that increases gradually over time.
  - Pain is usually worse at night and may be relieved by taking anti-inflammatory medicines, such as ibuprofen.
  - Local swelling.

- **Some other symptoms of chondrosarcoma include:**
  - Sharp or dull pain where the tumor is located. The pain usually is worse at night. and will become more constant as the bone cancer grows.
  - Swelling or redness at the tumor site.
  - A large lump at the site.
  - Limping or decreased use of the affected limb.

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3 How is chondrosarcoma diagnosed?

1. Initially could be an **X-ray** but should be further evaluated by a Computed tomography scan (also called a **CT or CAT scan**) or Magnetic resonance imaging (**MRI**) or a Positron emission tomography (**PET**) scan. This is used to determine the size and location of the tumor.

2. **Biopsy**. A procedure in which tissue samples are removed (with a needle or during surgery) from the body for exam under a microscope by a pathologist, preferably a pathologist that specializes in diagnosing bone, soft tissue, and connective tissue cancers.

3. A **genetic test** to determine what biomarkers your cancer cells have that are susceptible to medications. Genetic sequencing testing is not always done but should be included in the diagnostic protocol.

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4 Treatment options

Treatment may include:

Surgery:

Removal of the tumor with wide margins.

Post-surgical surveillance (Follow-up):

Scans include MRI, CT, or PET scans. Scans are typically done every three months to measure size and locations of tumors and may be extended to six months or a year if no tumors are found.

Physical therapy:

This treatment helps to regain strength and use of the affected area after surgery.

Radiation therapy:

Radiation, specifically proton radiation might be given at high doses to the affected areas.

Chemotherapy:

Chemotherapy is typically not prescribed because chondrosarcoma does not respond to traditional chemotherapy; however, some sub-types like mesenchymal do respond to chemotherapy.

Clinical Trials:

If recurrence or metastasis occurs there are clinical trials being done to inhibit, suppress or even destroy the cancer cells.

Off-label Medications:

Currently there are no FDA approved medications to treat chondrosarcoma. There are situations where medications are prescribed to treat inoperable tumors.

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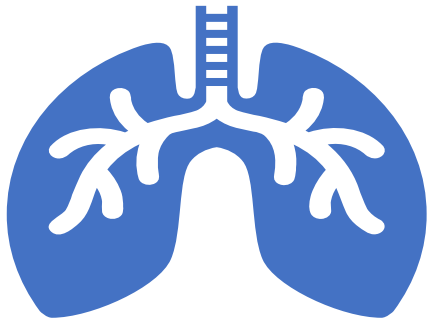
5 Recurrence and metastasis

Chondrosarcoma can resurface after surgery. If tumors appear in the same area that was surgically removed, then chondrosarcoma has recurred.



If tumors appear in another area of the body (typically the lungs) then chondrosarcoma has metastasized.

In most cases if recurrence or metastasis happens then chondrosarcoma tends to be inoperable and other treatment interventions need to be implemented.

6 Subtypes of chondrosarcoma

- There are over 50 types of sarcomas grouped into two categories:
  - **Soft tissue sarcomas**
  - **Bone sarcomas**
- Sarcomas differ based on cellular origin and genetic alterations. Chondrosarcomas are bone sarcomas most likely to develop in **joints, pelvis**, or in **long bones.**
- There are several subtypes of chondrosarcoma. It is very important to know your subtype and grade of chondrosarcoma.
- Both the subtype and grade have a bearing on how to treat chondrosarcoma and what decisions you and your medical team will have to make.
- Subtypes of chondrosarcoma are classified as:
  1. **Conventional**
  2. **Non-conventional**

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1. Conventional chondrosarcoma

- Most chondrosarcomas (roughly 80-90%) are known as conventional chondrosarcoma and occur as a primary malignant tumor in a previously normal bone. It is believed that conventional chondrosarcomas grow slowly, however in rare cases they can grow rapidly.

- It is believed, conventional chondrosarcoma generally occurs in older patients within the center of long bones of the extremities or within bones of the axial skeleton (pelvic bones, skull base, ribs, and sternum).

- Prevalence of conventional chondrosarcoma: Greater than 90% of conventional chondrosarcomas are grade I (low-grade) or grade II (intermediate grade) tumors. A large study by the Mayo Clinic revealed fewer than 5% of conventional chondrosarcomas are grade III.

Grades of conventional chondrosarcoma

Chondrosarcomas are graded according to a tumor's **histopathological profile** and/or through varying **imaging features.** Conventional chondrosarcoma is graded on a scale from I-III (low-grade: G1 to high-grade: G3).

❖ **Grade I:**

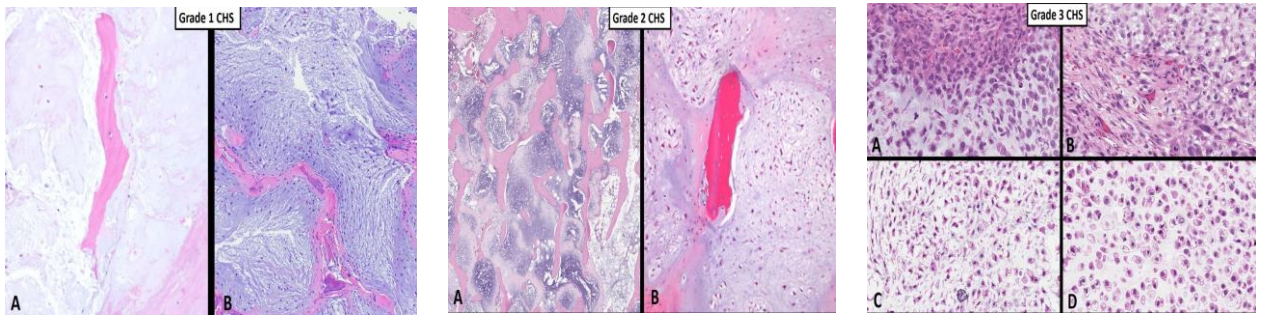
Chondrosarcoma, is low-grade characterized by slow growth and typically non-aggressive. Grade 1 rarely recurs or metastasizes. The prognosis is good with a five-year survival rate of 80-90%.

❖ **Grade 2:**

Chondrosarcoma is intermediate, more aggressive and can recur or metastasize. The five-year survival rate is 65 – 75%.

❖ **Grade 3:**

Chondrosarcoma is aggressive, recurrence and metastasis are very likely, and the five-year survival rate is 35-45%.



Side by Side comparison of Grade 1, 2 and 3 conventional chondrosarcomas, the higher the grade the more concentration of tumor cells.

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2. Non-Conventional chondrosarcomas

The remaining 10-20% of chondrosarcomas comprise a group of non-conventional chondrosarcomas including clear cell chondrosarcoma, mesenchymal chondrosarcoma, and dedifferentiated chondrosarcoma. The presentation, radiographic appearance, and prognoses of these rare variants differ from that of conventional chondrosarcoma.

A. **Clear-Cell chondrosarcoma**

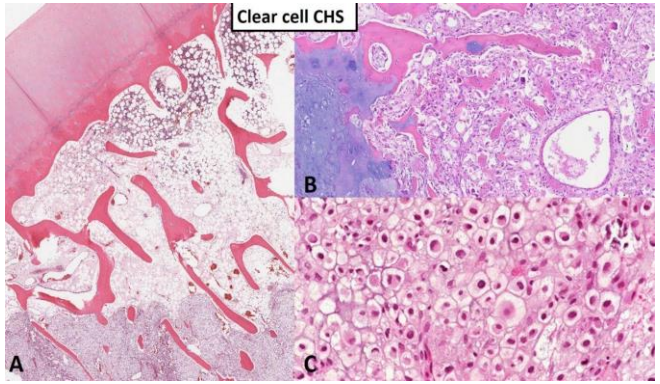
B. **Mesenchymal chondrosarcoma**

C. **Dedifferentiated chondrosarcoma**

D. **Extraskeletal Myxoid chondrosarcoma**

A. Clear-Cell chondrosarcoma

- Clear cell chondrosarcoma is a low-grade malignant chondrosarcoma generally affecting the epiphysis (ends) of long bones in older adults.
- A common finding in clear cell chondrosarcoma is the presence of conventional chondrosarcoma, osteoclast-like giant cells and woven bone fragments which, especially on small biopsies, can easily be misinterpreted.
- Surgery alone is the mainstay of treatment, and the prognosis in patients with clear-cell chondrosarcoma tends to be better than for patients with other chondrosarcomas.
- The five-year survival rate is 65%. These lesions can metastasize to the lung later; therefore, long-term follow-up for patients with pulmonary metastasis is warranted.



Clear cell chondrosarcoma. A Low power image of clear cell chondrosarcoma. **B** Approximately 50% of clear cell chondrosarcoma contains portions of conventional chondrosarcoma (left portion of image). **C** High power image shows polygonal tumor cells to clear cytoplasm (material) with prominent cytoplasmic membranes and condensed (dark) nuclei.

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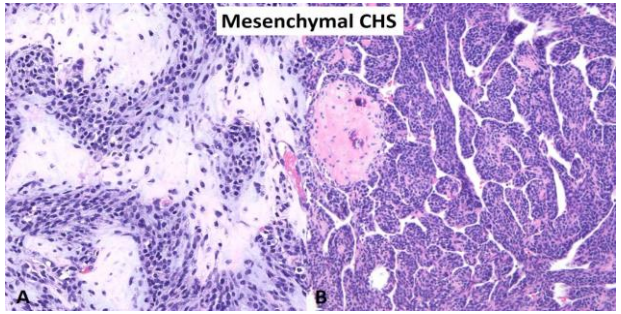
B. Mesenchymal chondrosarcoma

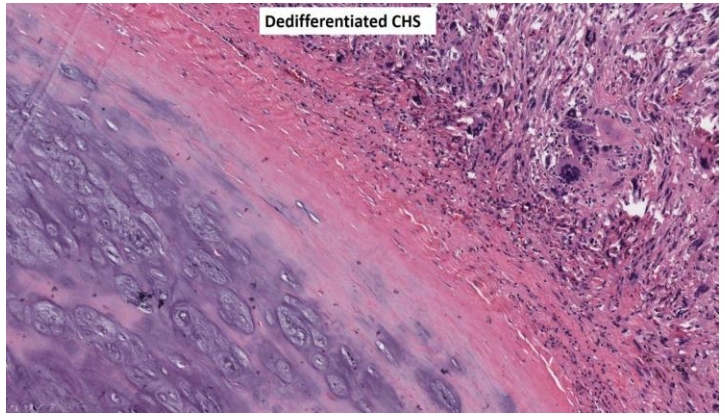
- Mesenchymal chondrosarcomas arise both in bone (70%) and in the soft tissues (30%). The most common locations are the jaw, pelvis, spine, and scapula.
- Mesenchymal chondrosarcoma contains a disease defining gene translocation, *HEY1:NCOA2*, which is seen as a fusion on chromosome 8 and is present in over 95% of cases.
- Mesenchymal chondrosarcoma is an indolent sarcoma with a poor long-term outcome due to high probability of late metastasis and ultimate death from disease.
- Surgical resection is the primary treatment for mesenchymal chondrosarcoma; however, in patients with a soft-tissue lesion, adjuvant chemotherapy and radiation may also play a role.
- There is a high likelihood of metastases to the lung, lymph nodes (unlike conventional chondrosarcoma), and other organs.
- Prognosis for patients with mesenchymal chondrosarcoma is fair; with a 5-year survival after wide resection of 60%.



Mesenchymal chondrosarcoma. A High-power image of mesenchymal chondrosarcoma showing a biphasic neoplasm (abnormal growth) consisting of a mixture of a small round blue cell tumor and a second component of well-differentiated hyaline (glass-like) cartilage. B Intermediate power photomicrograph showing a predominant small round blue cell tumor with nodules of hyaline cartilage.

C. Dedifferentiated chondrosarcoma

- Dedifferentiated chondrosarcoma is a rare sarcoma characterized by a low to intermediate grade tumors combined with a high-grade malignant sarcoma.
- Radiology is often helpful with the identification of dedifferentiated chondrosarcoma as these tumors may show distinct lower-grade and higher-grade components.
- Dedifferentiated chondrosarcoma has numerous molecular abnormalities including IDH1/2 mutations and a poor overall prognosis with high rates of metastasis and death from disease. These lesions typically appear very aggressive with significant bony destruction.
- The treatment regimen for dedifferentiated chondrosarcoma is like that for high-grade osteosarcoma—chemotherapy and surgical resection.
- The overall prognosis for patients with dedifferentiated chondrosarcoma is poor. Although local control can often be surgically achieved, distant disease (lung metastases) develops in 90% of patients. The 5-year survival for patients with this lesion is 18%.



Dedifferentiated chondrosarcoma. Intermediate power image showing a juxtaposition of two separate components without mixing; hyaline (glass-like) cartilage tumor on the lower left and a high-grade pleomorphic (malignant) spindle cell sarcoma on the upper right.

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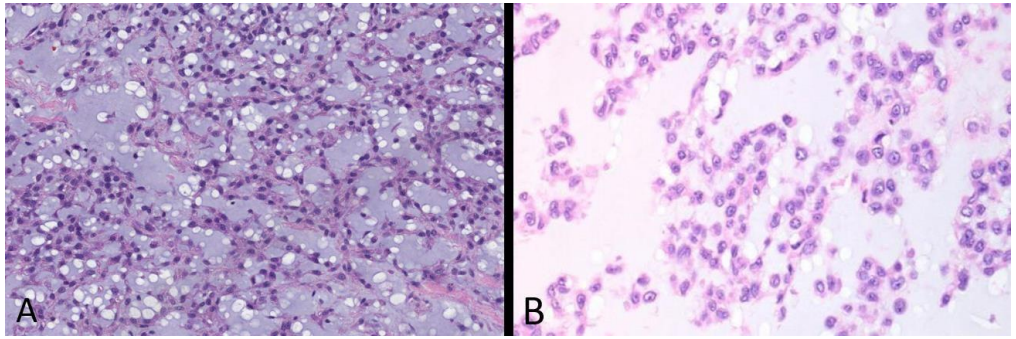
D. Extraskeletal Myxoid chondrosarcoma

- Chondrosarcoma can also arise in the soft tissue. These lesions are referred to as extraskeletal myxoid chondrosarcoma (EMC), or soft-parts chondrosarcoma.

- EMC is quite rare, and the treatment regimen for this tumor is like that for other soft-tissue sarcomas.

- Radiation therapy (preoperative or postoperative) is used in conjunction with surgical resection.

- Chemotherapy may play a role in the treatment regimen.



Extraskeletal myxoid chondrosarcoma
A Intermediate power and **B** high power images of extraskeletal myxoid chondrosarcoma show uniform round cells with scant eosinophilic cytoplasm growing in cords and chains with a chondromyxoid background. This tumor is not a “true” chondrosarcoma, despite its name, and is now known to be a translocation sarcoma forming an *EWSR1-NR4A3* fusion.

Other Rare Non-Conventional chondrosarcomas

- **Secondary Peripheral chondrosarcoma:**
  An uncommon subtype of conventional chondrosarcoma originating at the surface of the bone in a pre-existing osteochondroma, often in the setting of multiple hereditary exostosis (MHE). Histologic grading and prognosis of secondary peripheral chondrosarcoma is like that of conventional chondrosarcoma.

- **Periosteal chondrosarcoma:**
  A rare chondrosarcoma subtype representing 2.5% of all chondrosarcomas. Periosteal chondrosarcoma predominantly affects the metaphysis (fluted portion) of long bone and the tumor arises on the surface of the cortex, generally not involving the medullary canal. Periosteal chondrosarcomas are typically larger than 5.0 cm and there is often invasion of the underlying cortex. In contrast to conventional chondrosarcoma, histologic grading does not predict outcome. Periosteal chondrosarcoma has a relatively low metastatic rate (5-12%) and metastases will generally spread to the lung.

7 Taking Charge of Your Care: Here is what you can do:

a. Find a Sarcoma Treatment Center with a Sarcoma Specialist who has experience treating chondrosarcoma. (See the CS Foundation publication on ***Selecting a Sarcoma Treatment Center***).

b. Obtain a diagnosis from a pathologist that specializes in bone and soft tissue cancers and obtain a copy of that report for your records.

c. Make sure you understand the diagnosis including the subtype and grade of chondrosarcoma.

d. Insist on obtaining a genetic sequencing test to determine what biomarkers you have that are susceptible to medications and obtain a copy of that report for your records. Note: Not always covered by insurance, in some cases financial aide is available.

e. Learn as much as you can about chondrosarcoma, existing clinical trials, and all available treatment options.

f. Ask questions and keep asking until you understand the answers. Do not proceed with a treatment unless you are comfortable doing so and all your questions have been answered.

g. Look into your eligibility to participate in clinical trials.

h. You and your family play an important role in your medical team. You must be your own best advocate. Do not rely solely on your oncologist. Learn about all your available options and if you feel it is necessary seek out a second or even a third opinion.

i. Join one of the Facebook Support Groups on chondrosarcoma. The members are both CS Survivors and caretakers worldwide and will provide you with support, encouragement, and advice whenever you need it. They care and are responsive and can relate to your situation because of their own journeys. Two groups: Chondrosarcoma Care and Support Group and Chondrosarcoma Support Group.

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8 Final Thoughts

1. For each of these areas there are many details to consider. No brief narrative can cover all available information. Nor can it provide quick and easy answers to such complex and important questions. Selecting appropriate treatment, along with deciding where to receive that treatment are decisions that should solely be made by you and your family.

2. Take advantage of the resources that are available. Ask questions. Talk with healthcare providers, family, friends, other cancer patients and support groups; both those with chondrosarcoma and other types of cancer. Knowledge is power. Use knowledge to give yourself the best chance of winning against chondrosarcoma and living life on your terms, not cancer.

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9 Resources

Directories of Sarcoma Centers (By US State / By Country)

- Sarcoma Alliance: https://www.sarcomaalliance.org
- The Sarcoma Alliance for Research Through Collaboration: SARC: https://sarcomacoalition.us/what-is-sarcoma-and-sarcoma-centers-of-excellence/
- National Comprehensive Cancer Network Guidelines: https://www.nccn.org/patients/guidelines/content/PDF/bone-patient.pdf
- FaceBook Support Groups
  - Chondrosarcoma Support Group
  - Chondrosarcoma Care and Support Group
  - Mesenchymal Chondrosarcoma
  - Skull Based Chondrosarcoma
  - Chondrosarcoma CS Foundation Support