

# Osteochondromas: Benign Bone Tumors with Potential Complications

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BIO100 – Survey of Bioscience

## BACKGROUND

Osteochondromas are the most common benign bone tumors and typically develop during childhood or adolescence. They form as cartilage-capped bony projections near the growth plates of long bones such as the femur, tibia, and humerus. Although generally noncancerous, complications depend on size, location, and underlying genetic factors. (de Souza & Bispo Júnior, 2014)

## CAUSE & GENETICS

- Abnormal bone growth during development
- Can occur as a single lesion or multiple growths
- Linked to Multiple Hereditary Exostoses (MHE)
- Caused by mutations in EXT1 / EXT2 genes
- Disrupts normal cell growth and cartilage formation

(de Souza & Bispo Júnior, 2014)

## SYMPTOMS & RISKS

- Often painless lumps near joints
- May cause:
  - Pain
  - Limited movement
  - Nerve or vessel compression
- Rare complications:
  - Fractures
  - Vascular issues
  - Small risk of malignant transformation into chondrosarcoma

## DIAGNOSIS & TREATMENT

- Diagnosed using:
  - X-rays (primary imaging method)
  - MRI (evaluates cartilage cap thickness and malignancy risk)
- Treatment:
  - Observation if asymptomatic
  - Surgical removal if:
    - Pain or restricted movement
    - Nerve or vessel compression
    - Signs of malignant transformation

### Emerging Research: Gene Modification (CRISPR)

- CRISPR-Cas9 is being explored for genetic disorders
- May target EXT gene mutations in the future
- Currently experimental, not widely used clinically
- Raises ethical concerns, including:
  - Safety
  - Accessibility
  - Long-term effects

## PERSONAL CONNECTION

This topic is personally meaningful to me because a close family member experienced complications from osteochondromas, including progression to chondrosarcoma. This experience highlights how even benign conditions can significantly impact quality of life and emphasizes the importance of early detection and treatment. It also shows how the condition can have both short- and long-term effects.



Figure 1: Osteochondroma of the proximal tibia shown on radiograph (A) and CT 3D reconstruction (B). Adapted from de Souza & Bispo Júnior (2014).

## STATISTICS

- Accounts for ~35–50% of benign bone tumors
  - Most diagnosed before skeletal maturity
  - Higher prevalence in males
  - Malignant transformation risk:
    - ~1% (solitary)
    - Up to 5–10% (MHE)
- (Czajka & DiCaprio, 2015)

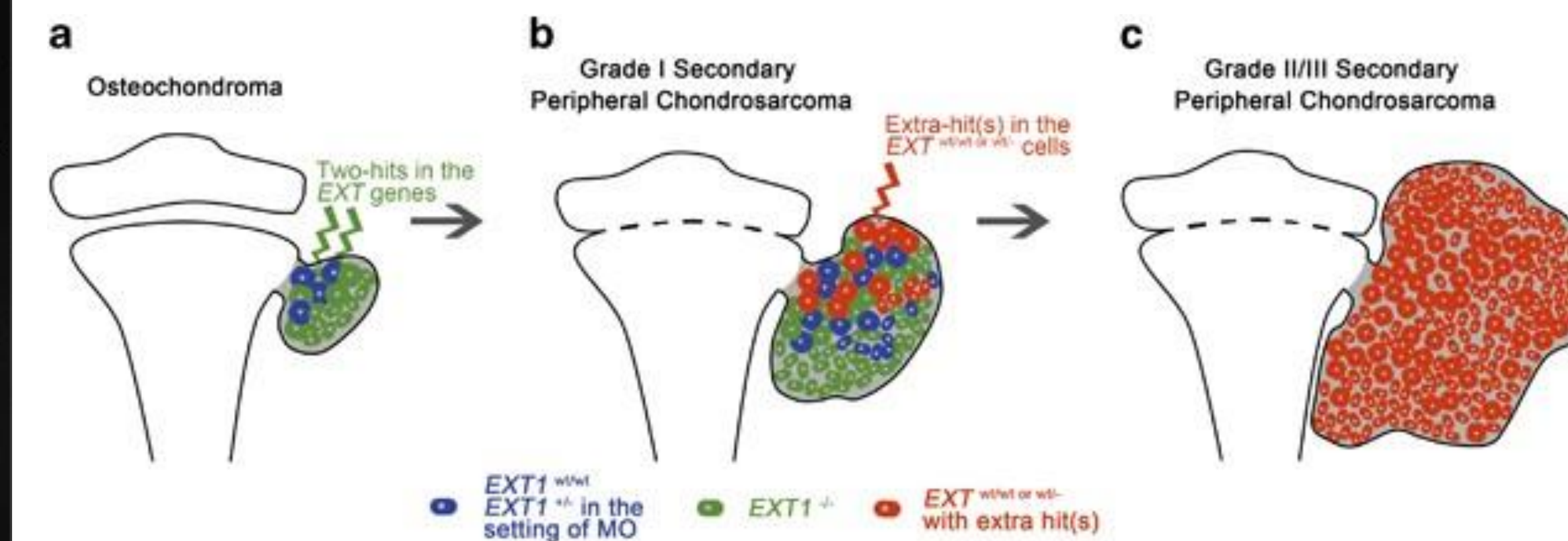


Figure 2: Progression of osteochondroma to secondary peripheral chondrosarcoma due to EXT mutations. Adapted from de Andrea et al. (2012).

## CONCLUSION

Osteochondromas are common and often benign, but they can lead to significant complications in certain cases. Understanding their genetic basis, risks, and treatment options is essential for effective management. Advances such as CRISPR may offer future solutions, though ethical and accessibility concerns remain.

## REFERENCES

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