

CASE REPORT

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Ipsilateral hip and knee joints ochronotic arthropathy treated by total joint replacement, a case report

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Abstract

Background: Ochronotic arthropathy affecting the hip and knee joints is one of the musculoskeletal manifestations of alkaptonuria which results from a tyrosine amino acid metabolism disorder. The condition has no definitive management; however, end-stage joint arthritis is well treated by total joint replacement.

Case presentation: We present a case of a healthy male patient who presented with left hip and bilateral knee (more on the left side) progressive pain and limitation of motion how was diagnosed as having advanced arthritis and was treated by total hip and total knee replacement for the left hip and knee joints respectively. Intraoperatively, the tissues had blackish discoloration characterizing ochronosis. This patient was diagnosed as having ochronotic arthropathy based on the intraoperative findings.

Conclusions: Accurate diagnosis of ochronotic arthropathy could only be reached intraoperatively; furthermore, end-stage joint arthritis could be treated efficiently by total joint replacement surgery.

Keywords: Ochronosis, Arthropathy, Total joint replacement, Hip, Knee, Case report

Background

Alkaptonuria is an autosomal recessive metabolic disease related to tyrosine metabolism, caused by deficiency of the homogentisic acid oxidase enzyme (which is normally active in the liver and kidneys), leading to deposition of oxidized homogentisate pigments in connective tissues causing black discoloration of the skin, sclera, joint cartilage and urine (Keller et al. 2005).

Accurate early diagnosis is always delayed due to the rarity of the condition and early mild symptoms; however, multiple joints (spine, shoulder, hip, and knee) degeneration and arthropathy were reported (Drakoulakis et al. 2012).

If ochronosis is suspected, a simple bedside diagnostic test could be performed by adding caustic soda (NaOH) to the patient's urine sample, which will lead to dark brown discoloration and elevated homogentisic acid levels in the urine could help establish the diagnosis (Drakoulakis et al. 2012; Ranganath et al. 2013).

No curative therapy was proposed for this condition; some authors suggested a phenylalanine and tyrosine restricted diet and high doses of ascorbic acid with unproven definite benefit (Haas et al. 1998; Forslind et al. 1988; Cetinus et al. 2005); however, an optimum treatment for an end-stage ochronotic arthropathy (especially for the hip or knee joints) is total joint replacement (Ilyas et al. 2020; Al-Ajlouni et al. 2020; Karaoglu et al. 2016; Jasper et al. 2016; Patel 2015).

We describe a case of a male patient who presented with ipsilateral hip and knee ochronotic arthropathy treated by total joint replacement.

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Case presentation

A 61-year-old male patient was admitted with a history of left hip and bilateral knee (more on the left side) pain for the past three years.

History

The patient gave no history of medical comorbidity except for hypertension controlled with medications and no history of trauma. Joint pain developed gradually throughout the disease course, controlled by analgesics, then the intensity of the pain increased, which interfered with the patient's daily activities. The patient reported that pain was more on the left hip and knee and was minimal on the right knee.

Examination

Clinical evaluation

Generally, no cutaneous signs of ochronosis in the form of skin discoloration were noted at the time of presentation; however, spots of sclera blackish discoloration bilaterally were detected (Osler sign) (Fig. 1). The patient denied any history of urine discoloration or darkening. On local examination, the patient was walking with an antalgic gait, having a flexion attitude of the spine and knee bilaterally. The left hip motion was painful and

limited with flexion, abduction, and internal and external rotation degrees of 60, 30, 10, and 10 degrees. The left knee showed varus and flexion deformity on inspection. Tenderness over the knee medial joint line and the patellofemoral joint. The range of motion ranged from 10 to 100 degrees with painful last degrees of flexion, and a positive grinding test for the patellofemoral joint.

Radiological evaluation

Plain radiograph of the pelvis showing the hip joint bilaterally revealed an advanced osteoarthritis of the left hip joint with a partial collapse of the femoral head (Fig. 2A). Bilateral knee plain radiographs (anteroposterior and lateral views) showed bilateral knee osteoarthritis more on the left side with subchondral sclerosis and reduced medial joint space (Fig. 2B and C). The plain radiographs of the dorsal and lumbar spine showed osteopenia and calcifications of the intervertebral discs (Fig. 3) (Wu et al. 2018).

Surgical management

We decided to perform a cemented total hip replacement (THR) for the left hip first, then a total knee replacement (TKR) for the left knee in another session. THR was performed through a direct lateral approach to the hip, blackish discoloration of the tissues (iliotibial band, hip

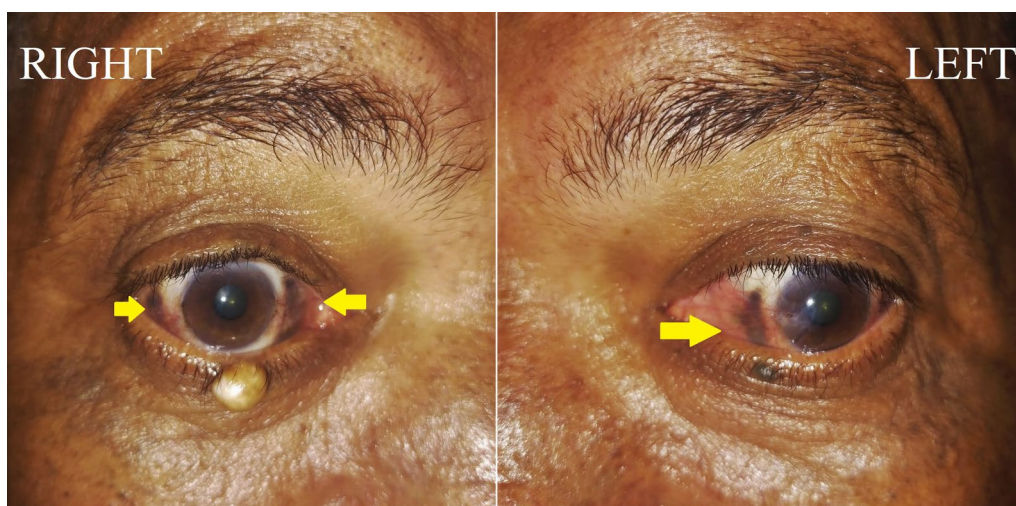


Fig. 1 Clinical image of the patient eyes showing a blackish discoloration of the sclera (Osler signs) indicated by yellow arrowheads



abductor muscles, and the femoral head articular surface) was noted while performing the surgery (Fig. 4A). For the TKR, the surgery was performed through a medial parapatellar approach; blackish discoloration was noted on the quadriceps tendon, the patellar surface, the tibial articular surface, the femoral articular surface, and within the substance of the medial meniscus. There was knee synovium hypertrophy with tiny black dots embedded within the synovium (Fig. 4B).

Both surgeries were 11 months apart; the surgeries went smoothly without any reported complications or the need for blood transfusion postoperatively. The postoperative period went uneventful; no wound healing problems or infection was reported, postoperative radiographs showed a stable position of the implants (Fig. 5).

Discussion

Ochronosis is a musculoskeletal manifestation of alkaptonuria which is a rare disease caused by defective tyrosine amino acid metabolism due to an autosomal recessive mutation of the homogentisic acid oxidase gene that affects about one in a million people (Phornphutkul et al. 2002).

The condition is characterized by deposition of blackish ocher (which means yellow in Greek) metabolites most commonly in connective tissues, mainly the hyaline cartilage leading to a degeneration of the cartilage and the development of the ochronotic arthropathy seen commonly in the spine, hip, and knee joints which presents clinically in around the fourth decade (Mistry et al. 2013; Gil et al. 2016). In about 70% of patients, ocular pigmentation localized to the sclera could be found (as in the current case), referred to as the Osler sign (Jasper et al. 2016).

Although no definitive medical treatment for this condition has been proposed until now, some reports discussed the occurrence of ochronotic arthropathy and its effective management through total joint replacement with accepted outcomes at a long-term follow-up (Ilyas et al. 2020; Al-Ajlouni et al. 2020; Karaoglu et al. 2016). The current report presents a case of ipsilateral hip and knee ochronotic arthropathy managed effectively by total hip and knee replacement, respectively.

Ochronotic arthropathy could be challenging to diagnose and often diagnosed intraoperatively after finding the pathognomonic blackened tissues and joint surfaces (Patel 2015; Carrier and Harris 1990); however, establishing an early diagnosis will help avoid future tendons rupture. In the current case, we could not reach a diagnosis until we performed the surgery on the left hip and further confirmation after operating on the left knee where the pathognomonic blackish discoloration of the tissues and the joint articular surface was found.

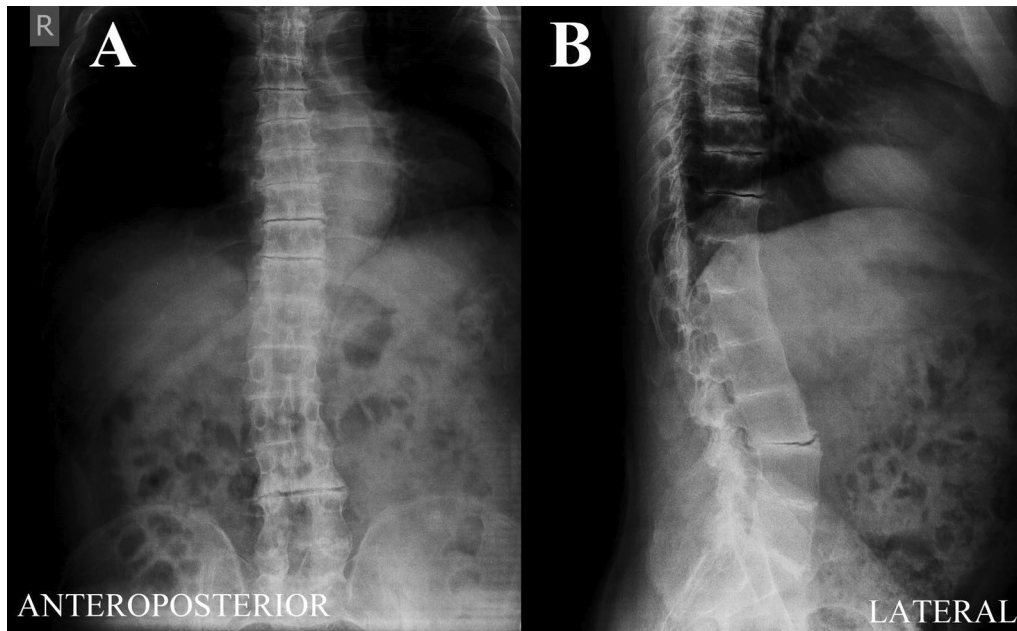
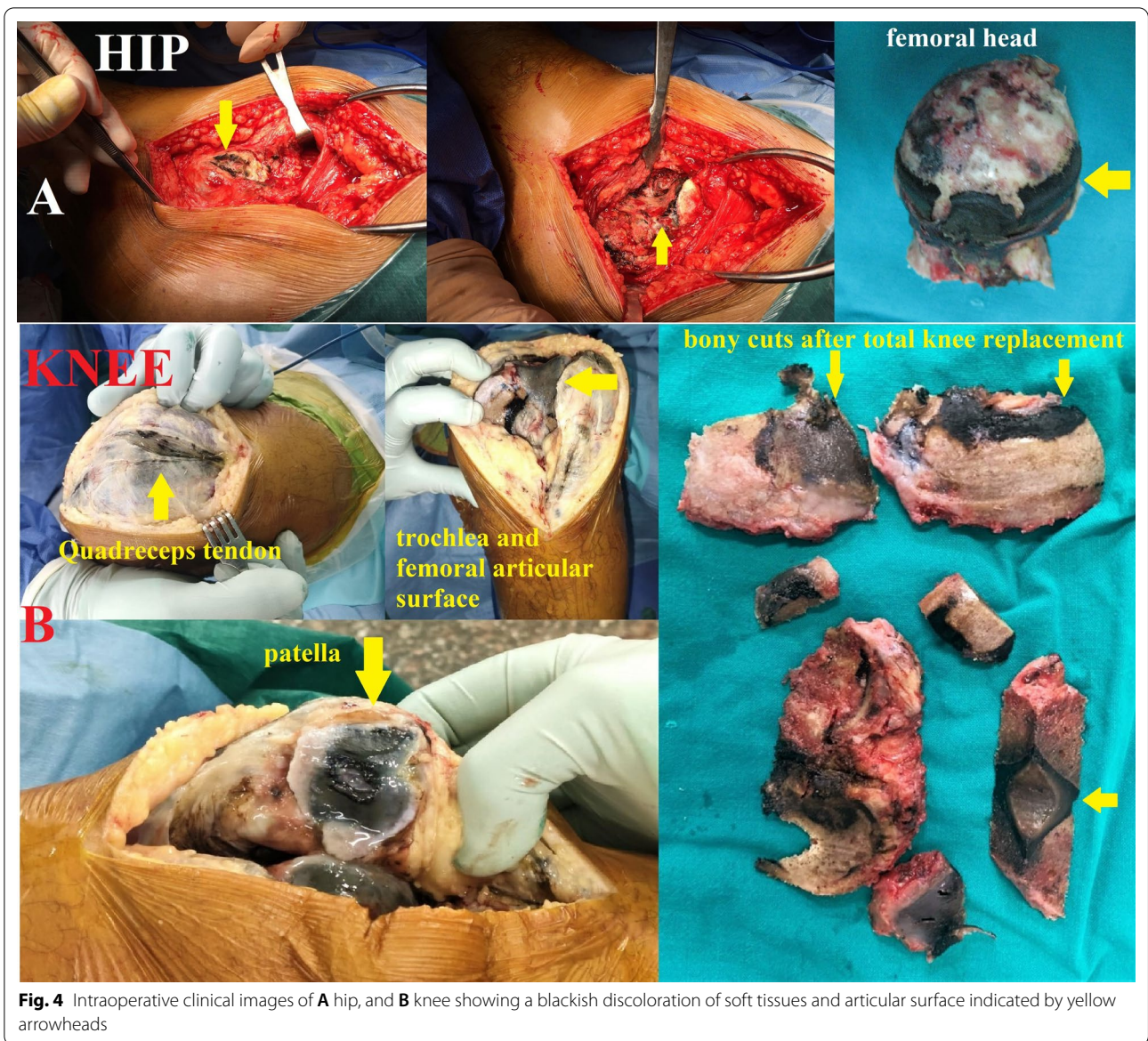


Fig. 3 Anteroposterior (A) and lateral (B) Plain radiographs of the dorsal and lumbar spine showing osteopenia and calcification of the intervertebral discs



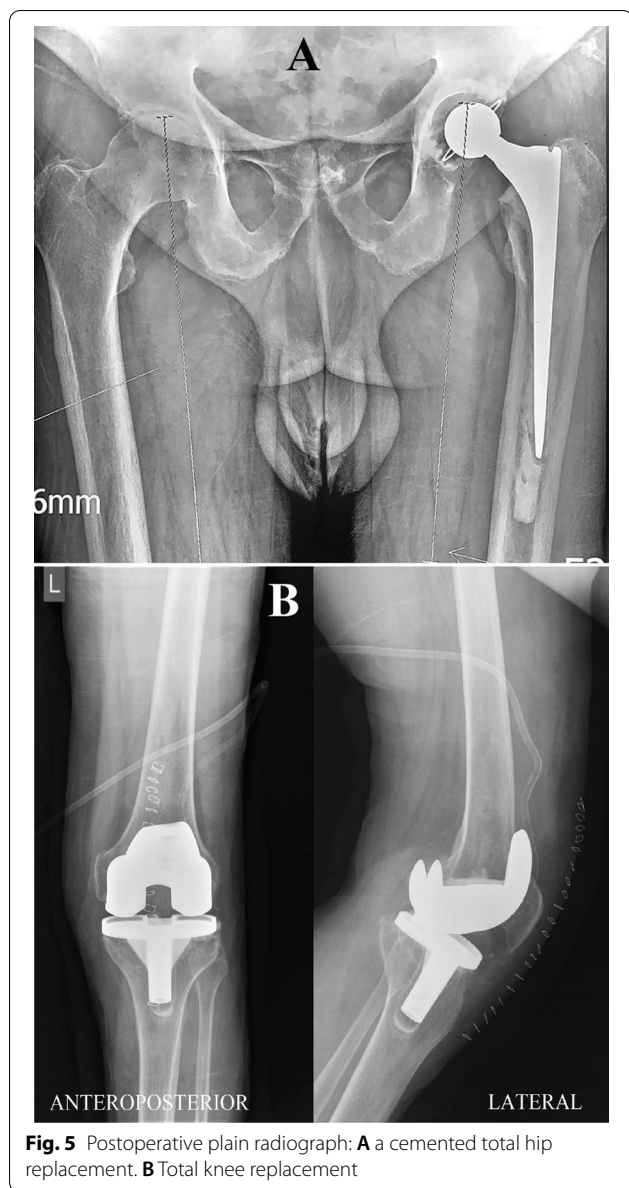


Fig. 5 Postoperative plain radiograph: **A** a cemented total hip replacement. **B** Total knee replacement

Conclusions

Ochronotic arthropathy is one of the musculoskeletal manifestations of alkaptonuria caused by defective tyrosine amino acid metabolism, mainly affecting the spine, hip, and knee joints. Diagnosis could only be reached during surgery by the characteristic appearance of blackened tissues and joint articular surfaces. Although a curative treatment is not available for such a condition, managing ochronotic arthropathy through total joint replacement surgery is the optimum management line for severely affected joints.

Abbreviations

THR: Total hip replacement; TKR: Total knee replacement.

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Authors' contributions

AMA and AAK carried out the case report idea and performed the surgeries; MMM carried out data acquisition and patient assessment. AAK and HB carried out a literature search, drafted the manuscript, and designed the figures; MMM and AMA did the critical revision. All authors discussed the results, commented on the manuscript, read and approved the final version. All authors participated in revising the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

All the data regarding the presented case are included in the article.

Declarations

Ethics approval and consent to participate

The ethical committee of our institution waived ethical approval for this case report as this was considered a part of the usual patients' care (Faculty of Medicine, Assiut University, Egypt (Telephone, Fax: +20882332278, ethics-committee12@yahoo.com, <http://afm.edu.eg>).

Consent for publication

A verbal, as well as an informed written consent, was obtained from the patient to use his clinical data and images for publication of this case report; no identification of the patients' identity is present neither in the manuscript nor in the images. Verbal and written consent was taken from the patient to include the clinical image of his eyes (Fig. 1) in the images included within the manuscript.

Competing interests

The authors declare that they have no competing interests.

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References

- Al-Ajlouni JM, Alisi MS, Yasin MS, Khanfar A, Hamdan M, Halaweh AA, Al-Hawamdeh H, Eleisi K, Alsou MS (2020) Long-term outcomes of the knee and hip arthroplasties in patients with alkaptonuria. *Arthroplasty Today* 6(4):689–693. <https://doi.org/10.1016/j.artd.2020.07.037>
- Carrier DA, Harris CM (1990) Bilateral hip and bilateral knee arthroplasties in a patient with ochronotic arthropathy. *Orthop Rev* 19(11):1005–1009
- Cetin E, Cever I, Kural C, Erturk H, Akyildiz M (2005) Ochronotic arthritis: case reports and review of the literature. *Rheumatol Int* 25(6):465–468. <https://doi.org/10.1007/s00296-004-0538-x>
- de Haas V, Carbasius Weber EC, de Klerk JB, Bakker HD, Smit GP, Huijbers WA, Duran M, Poll-The BT (1998) The success of dietary protein restriction in alkaptonuria patients is age-dependent. *J Inher Metab Dis* 21(8):791–798. <https://doi.org/10.1023/a:1005410416482>
- Drakoulakis E, Varvitsiotis D, Psarea G, Feroussis J (2012) Ochronotic arthropathy: diagnosis and management: a critical review. *Am J Orthop (Belle Mead NJ)* 41(2):80–83

- Forslind K, Wollheim FA, Akesson B, Rydholm U (1988) Alkaptonuria and ochronosis in three siblings. Ascorbic acid treatment monitored by urinary HGA excretion. *Clin Exp Rheumatol* 6(3):289–292
- Gil JA, Wawrzynski J, Waryasz GR (2016) Orthopedic manifestations of ochronosis: pathophysiology, presentation, diagnosis, and management. *Am J Med* 129(5):536.e1–536.e6. <https://doi.org/10.1016/j.amjmed.2016.01.010>
- Ilyas I, Kashif S, Algashiri MF, Rabbani SA, Aldakhil SS, Al-Mohrej OA (2020) Long-term follow-up of bilateral hip and knee arthroplasty secondary to ochronotic arthropathy. *Arthroplasty Today* 6(2):214–219. <https://doi.org/10.1016/j.artd.2020.01.012>
- Jasper J, Metsaars W, Jansen J (2016) Ochronosis of the knee with secondary osteoarthritis requiring total knee replacement in a patient with cryptogenic organising pneumonia. *BMJ Case Rep*. <https://doi.org/10.1136/bcr-2016-215412>
- Karaoglu S, Karaaslan F, Mermerkaya MU (2016) Long-term result of arthroplasty in the treatment of a case of ochronotic arthropathy. *Acta Orthop Traumatol Turc* 50(5):584–586. <https://doi.org/10.1016/j.aott.2016.08.018>
- Keller JM, Macaulay W, Nercessian OA, Jaffe IA (2005) New developments in ochronosis: review of the literature. *Rheumatol Int* 25(2):81–85. <https://doi.org/10.1007/s00296-004-0498-1>
- Mistry JB, Bukhari M, Taylor AM (2013) Alkaptonuria. *Rare Dis (Austin, Tex)* 1:e27475. <https://doi.org/10.4161/rdis.27475>
- Patel VG (2015) Total knee arthroplasty in ochronosis. *Arthroplasty Today* 1(3):77–80. <https://doi.org/10.1016/j.artd.2015.03.003>
- Phornphutkul C, Introne WJ, Perry MB, Bernardini I, Murphey MD, Fitzpatrick DL, Anderson PD, Huizing M, Anikster Y, Gerber LH, Gahl WA (2002) Natural history of alkaptonuria. *N Engl J Med* 347(26):2111–2121. <https://doi.org/10.1056/NEJMoa021736>
- Ranganath LR, Jarvis JC, Gallagher JA (2013) Recent advances in management of alkaptonuria (invited review; best practice article). *J Clin Pathol* 66(5):367–373. <https://doi.org/10.1136/jclinpath-2012-200877>
- Wu K, Bauer E, Myung G, Fang MA (2018) Musculoskeletal manifestations of alkaptonuria: a case report and literature review. *Eur J Rheumatol* 6(2):98–101. <https://doi.org/10.5152/eurjrheum.2018.18116>

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