Title 95/100 characters (excluding spaces)
Charactering taper junction wear helps understand the mechanism of failure of metal on metal hip replacements.

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Summary: /200
We analyzed 146 retrieved cobalt-chromium head tapers, using a roundness measurement machine. We report four different patterns of material loss on the head taper that develop gradually over time.

Abstract: 2189/3200

Introduction:
Taper junction material loss is the result of corrosion and mechanical wear. The significance of the taper junction material loss is highlighted by studies that compared resurfacing and total hip replacements of the same type and size. High volumes of material loss are reported, especially from the head taper, but the pattern of wear is unknown. One report characterized the material loss pattern of five tapers (n=5) into axisymmetrical and asymmetrical, along the long axis of the taper. We noticed more than two patterns on our retrievals and we set out to characterize these types and relate them to clinical variables.

Methods:
We retrospectively analysed retrieved cobalt-chromium tapers (n=146) using a roundness measurement machine. We also performed a corrosion classification and collected clinical data (metal ion levels, time to revision, component sizes). A non-blinded author devised a four-group classification (*table*). Two blinded authors classified the material loss patterns derived from the roundness measurement machine.

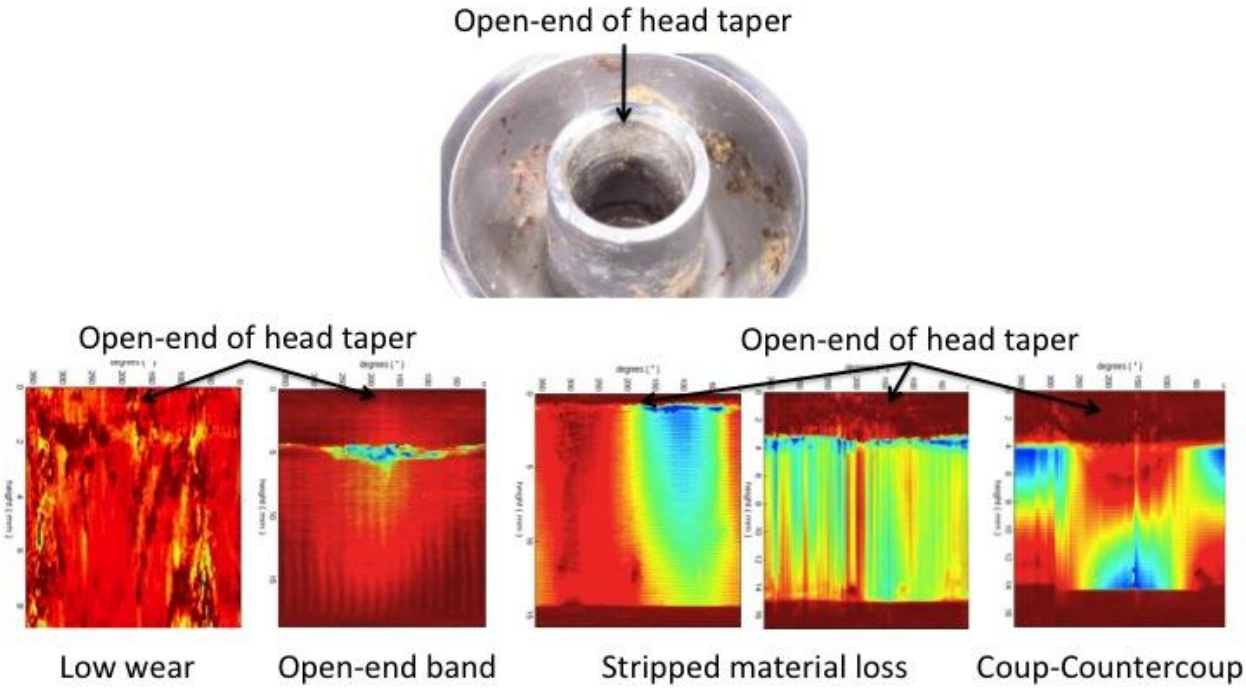
Results:
The four groups of material loss patterns Low wear (n= 62), Open-end band (n=29), Stripped material loss (n=51) and Coup-Countercoup (n=4). Kappa was 0.78 ($p<0.001$) in the assessment of interobserver reliability.

Kruskal-Wallis test revealed:
- Significantly higher volumes of wear on the taper of Stripped material loss compared to Low wear ($p<0.001$) and Open-end band compared to Low wear ($p<0.001$) groups.
- Significantly higher chromium ion blood levels in the open-end band compared to the Stripped material loss group.
- Significantly higher Cobalt ion blood levels in the Stripped material loss compared to the Low wear group
- Significantly higher Cobalt/Chromium ration in the Open-end band compared to the Low wear group

One-way ANOVA analysis revealed:
- Significant difference between in the head sizes between the groups ($p=0.01$). Post-hoc analysis located the difference between the Low wear (median=40, range=20) and Open-end band (median=49, range=20) groups ($p<0.001$).
- Significantly higher time to revision in the Stripped material loss compared to the Low wear group ($p=0.05$), in the post-hoc analysis.
- Significantly higher corrosion scores in the Stripped material loss compared to the Low wear group ($p<0.001$) and the Open-end band compared to the Low wear group ($p<0.001$).

Discussion:
The results suggests that corrosion becomes worse over time and that the material loss pattern evolves gradually from the Low wear to Open-end band and finally to Stripped. Further analysis is required to assess the factors that affect the Coup-countercoup group.

Taper wear pattern	Definition	Number	Clinical Significance
Low wear	Volume of material loss less 1 mm^3	62	Well sealed or not yet worn taper
Open-end band	Band of material loss a the opening of the taper	29	First stages of material loss
Stripped material loss	Material loss along the long axis of the taper	51	Generalized material loss on the surface
Coup-Countercoup	Material loss at diagonally opposing areas along the long axis of the taper	4	Material loss due to rocking of the head on the trunnion


Open-end of head taper
Open-end of head taper
Open-end of head taper
Low wear
Open-end band
Stripped material loss
Coup-Countercoup