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Review Title: Correlation of Radiographic Findings with Symptomatology in Cervical Degenerative Joint Disease

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Study Title:

The correlation of radiographic findings and patient symptomatology in cervical degenerative joint disease: a cross-sectional study

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Background Information:

It is estimated that 66% of the population will experience neck pain or related symptoms at some point in their lives, with the highest prevalence occurring in middle-aged individuals (1, 2). Neck pain is the second most frequently reported musculoskeletal complaint seen by healthcare practitioners (3) and commonly does not fully resolve (4). It is also the fourth leading cause of disability worldwide!

Degenerative joint disease (DJD) accounts for 3.3 cases of neck pain in every 1000 people (5) and is characterized by degenerative changes including intradiscal tears, disc space loss, osteophytic growths, spur formation, ligamentous hypertrophy, and capsular thickening (6). Most commonly cervical DJD presents as neck pain, activity related neck stiffness, headaches and/or upper limb referral (6).

Although MRI is the most advanced method for evaluating DJD, plain film radiography is still most commonly used as it is more easily accessible and cost effective. However, it is well-known that radiographic findings do not correlate well with symptoms (7). In fact, it has been suggested that ordering radiographs purely on suspicion of DJD is not warranted in most cases. The current study aimed to examine the potential correlation and diagnostic

test accuracy of hallmark symptoms in determining the presence, type, and severity of cervical DJD on radiograph.

Pertinent Results:

322 subjects (162 male, 160 female; average age 40.5) were assessed. Of these, 78 had no signs of cervical DJD.

Kellgren and Lawrence Osteoarthritis Severity Grading System:

Linear regression analysis was conducted to determine the relationship between the Kellgren Lawrence grade and the independent variables, including gender, age, VAS, presence of neck stiffness, presence of headache, presence of shoulder referral, and presence of hand radiculopathy and numbness. Only age showed any significant results. For every 16.7 years an individual ages, their grade on the Kellgren Lawrence scale is expected to increase by 1. Reported neck stiffness and shoulder referral show mild evidence of diagnostic accuracy in the prediction of DJD. However, although there was statistical significance, the low levels of diagnostic accuracy call their significance into question.

Presence of Cervical Facet Joint Hypertrophy:

Logistic regression analysis comparing the presence of cervical facet joint hypertrophy with the above-mentioned independent variables (again) only showed a significant relationship with age. For every increase of 1-year in age, the odds of having facet hypertrophy increased by 1.12. Reporting neck stiffness slightly increased the chance of having facet hypertrophy, but despite reaching statistical significance, it failed to show clinical significance. Hand radiculopathy and hand numbness demonstrated a high specificity for facet joint hypertrophy, meaning that it is unlikely that a patient showing no facet joint hypertrophy will report hand radiculopathy or numbness.

Presence of Cervical Uncinate Process Hypertrophy:

Logistic regression analysis comparing uncinat process hypertrophy to the above-mentioned independent variables (again) only showed a significant relationship with age. For every 1-year increase in age, the odds of having uncinat process hypertrophy increased by 1.15. The presence of neck stiffness showed a small increase in the odds of having uncinat process hypertrophy, while hand radiculopathy and numbness showed a high specificity for uncinat process hypertrophy, meaning that it is unlikely that a patient showing no uncinat process hypertrophy will report hand radiculopathy or numbness.

Overall, only age showed a correlation to cervical DJD. Although hand radiculopathy and numbness showed high specificity for the presence of facet joint and uncinat process hypertrophy, this does not help the clinician to predict the presence or absence of cervical DJD from the symptomatic presentation and is therefore of limited clinical use.

Clinical Application & Conclusions:

The study, in agreement with much prior research, showed that clinical symptoms, including pain levels (VAS), headaches, shoulder referral, and hand radiculopathy or numbness, do not correlate with radiographic findings of DJD in the cervical spine. Since age was the only independent variable that was statistically related in a significant manner to cervical spine DJD, cervical radiographs are not likely to be of use in cases of suspected DJD.

Study Methods:

Data was collected from patient records, including cervical radiographs taken between April 2010 and June 2012, from three Macquarie University Chiropractic Teaching Clinics. Radiographic studies were excluded if the patient was under 18 years of age, if the patient files were absent or incomplete, or if the cervical radiographic quality was too poor to interpret.

Data was collected by two members of the research team from the clinic's radiographic report database and the following information was recorded:

- Patient's name
- Date of birth
- Gender
- Presence of DJD (yes/no) on cervical anteroposterior (AP) and lateral views
- Presence of facet hypertrophy and uncinate process hypertrophy (yes/no)

Radiographs showing DJD were further assessed by the same two researchers and the DJD was graded using the Kellgren and Lawrence Osteoarthritis Severity Grading System (8). This system uses the presence and severity of osteophytes, disc space narrowing, and sclerosis to give the DJD a grade of 1 to 4 as outlined below:

1. Grade 0: no signs of degenerative disc disease
2. Grade 1: minimal anterior osteophytes
3. Grade 2: Definite anterior osteophytosis with possible narrowing of the disc and some sclerosis of vertebral plates
4. Grade 3: Moderate narrowing of the disc space with definite sclerosis of vertebral end plates and osteophytosis
5. Grade 4: Severe narrowing of the disc space with definite sclerosis of vertebral plates and multiple large osteophytes

Names of included patients were provided to three other members of the research team who located the patient's clinical files and then extracted the following clinical data:

- Cervical pain levels (measured using the visual analog scale – VAS)
- The presence of headaches, neck stiffness, pain referral to the shoulders, radicular symptoms to the hands, and numbness in the hands (yes/no) as reported by the patient

The data was then passed on to another member of the research team to analyse and compare the results.

Correlations between radiographic findings of cervical DJD and independent predictor variables, including gender, age, VAS, presence of neck stiffness, presence of headache, presence of shoulder referral, and presence of hand radiculopathy and numbness, were assessed using linear or logistic regression analysis. Dichotomous data, including the presence of facet hypertrophy and uncinate hypertrophy, were tested for positive and negative correlations to the above independent predictor variables using diagnostic accuracy testing. Finally, ROC curves were used to assess the diagnostic test accuracy of continuous data compared to dichotomous data. A 95% CI was calculated to assess for statistical significance.

Study Strengths / Weaknesses:

Strengths:

- Radiographic evaluations were performed by two independent researchers and any discrepancies were discussed and arbitrated by a chiropractic radiologist.

Weaknesses:

- Intra- and inter-observer reproducibility was not established for the radiographic interpretation or data collection.
- The retrospective study design could have skewed the sample towards subjects with symptomatology.
- Clinical files were accessed to obtain clinical data. Therefore, there is the potential for inter-practitioner inconsistencies in recording symptomatic data at the time of patient consultation.
- The study only assessed for degeneration in any one of the cervical discs, facet joints, or uncovertebral joints and did not account for multi-level presentations.

Additional References:

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