DW MRI of CHOLESTEATOMA

3. NON-EPI>< DELAYED POST Gd T1: MATERIAL AND METHODS

DW MRI of CHOLESTEATOMA

3. NON-EPI>< DELAYED POST Gd T1: MATERIAL AND METHODS

- ✓120 Cholesteatoma patients

DW MRI of CHOLESTEATOMA

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- ✓120 Cholesteatoma patients:
  - ✓ Period: July 2005 - June 2008 (retrospective)

DW MRI of CHOLESTEATOMA

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DW MRI of CHOLESTEATOMA

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- ✓120 Cholesteatoma patients:
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  - ✓ 57 Acquired Cholesteatoma

DW MRI of CHOLESTEATOMA

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- ✓120 Cholesteatoma patients:
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DW MRI of CHOLESTEATOMA

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  - ✓ 42 Recurrent Cholesteatoma
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DW MRI of CHOLESTEATOMA

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DW MRI of CHOLESTEATOMA

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- ✓120 Cholesteatoma patients: (95)
  - ✓ Period: July 2005 - June 2008 (retrospective)
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  - ✓ 57 Acquired Cholesteatoma (50)
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DW MRI of CHOLESTEATOMA

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  - ✓ Period: July 2005 - June 2008 (retrospective)
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    - 15 empty retraction pockets
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DW MRI of CHOLESTEATOMA

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  - ✓ 21 Residual Cholesteatoma

DW MRI of CHOLESTEATOMA

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    - 15 empty retraction pockets
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3. NON-EPI>< DELAYED POST Gd T1: MATERIAL AND METHODS

DW MRI of CHOLESTEATOMA

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- ✓3 blinded MR data sets:

DW MRI of CHOLESTEATOMA

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- ✓3 blinded MR data sets:
  - ✓1st DATA SET: "DELAYED POST-Gd T1"
    - Ax 3D TSE T2, Cor TSE T2, ax/cor T1

DW MRI of CHOLESTEATOMA

3. NON-EPI>< DELAYED POST Gd T1: MATERIAL AND METHODS

- ✓3 blinded MR data sets:
  - ✓1st DATA SET: "DELAYED POST-Gd T1"
    - Ax 3D TSE T2, Cor TSE T2, ax/cor T1
  - ✓ 2nd DATA SET: "NON-EP DWI"
    - Non-EP DWI

DW MRI of CHOLESTEATOMA

3. NON-EPI>< DELAYED POST Gd T1: MATERIAL AND METHODS

- ✓3 blinded MR data sets:
  - ✓1st DATA SET: "DELAYED POST-Gd T1"
    - Ax 3D TSE T2, Cor TSE T2, ax/cor T1
  - ✓ 2nd DATA SET: "NON-EP DWI"
    - Non-EP DWI
  - ✓3rd DATA SET: "COMBINED"
    - Non-EP DWI
    - Ax 3D TSE T2, Cor TSE T2, Ax/Cor T1

DW MRI of CHOLESTEATOMA

3. NON-EPI>< DELAYED POST Gd T1: MATERIAL AND METHODS

DW MRI of CHOLESTEATOMA

3. NON-EPI>< DELAYED POST Gd T1: MATERIAL AND METHODS

- ✓4 reviewers:

DW MRI of CHOLESTEATOMA

3. NON-EPI>< DELAYED POST Gd T1: MATERIAL AND METHODS

- ✓4 reviewers:
  - ✓2 Experienced H&N Radiologists
    - R1 and R2

DW MRI of CHOLESTEATOMA

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    - R1 and R2
  - ✓ 1 Resident in Radiology
    - R3

DW MRI of CHOLESTEATOMA

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    - R1 and R2
  - ✓ 1 Resident in Radiology
    - R3
  - ✓1 General Radiologist
    - R4

DW MRI of CHOLESTEATOMA

4. NON-EPI>< DELAYED POST Gd T1:STATISTICAL ANALYSIS

- ✓ Interobserver agreement
- ✓ Intraobserver agreement
- ✓ Sensitivity – Specificity
  - ✓Overall
  - ✓Plot by Observer and Method
- ✓ PPV – NPV
  - ✓Overall
  - ✓Plot by Observer and Method
- ✓ Difference in sensitivity and specificity by observer and method

DW MRI of CHOLESTEATOMA

5. NON-EPI>< DELAYED POST Gd T1: RESULTS

- ✓ Interobserver agreement
- ✓ Intraobserver agreement
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  - ✓Plot by Observer and Method
- ✓ PPV – NPV
  - ✓Overall
  - ✓Plot by Observer and Method
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DW MRI of CHOLESTEATOMA

5. NON-EPI>< DELAYED POST Gd T1: Results: interobserver agreement

Overall Kappa Coefficient of Interobserver Agreement

Method	Kappa coefficient	Lower 95% confidence limit for Kappa	Upper 95% confidence limit for Kappa
Delayed post-Gd T1	0.363	0.347	0.379
non-EP DWI	0.788	0.775	0.802
Combined	0.781	0.768	0.794

DW MRI of CHOLESTEATOMA

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DW MRI of CHOLESTEATOMA

5. NON-EPI>< DELAYED POST Gd T1: RESULTS: intraobserver agreement

Intraobserver Reliability by Method: Weighted Kappa Coefficients of Agreement

	Method								
	Delayed post-Gd T1			non-EP DWI			Combined		
Observer	Kappa coefficient	Lower 95% confidence limit for Kappa	Upper 95% confidence limit for Kappa	Kappa coefficient	Lower 95% confidence limit for Kappa	Upper 95% confidence limit for Kappa	Kappa coefficient	Lower 95% confidence limit for Kappa	Upper 95% confidence limit for Kappa
1	0.894	0.844	0.943	0.982	0.962	1.000	0.976	0.953	0.999
2	0.549	0.446	0.651	0.875	0.815	0.936	0.814	0.730	0.897
3	0.826	0.758	0.894	0.979	0.948	1.000	0.926	0.882	0.970
4	0.518	0.399	0.637	0.885	0.828	0.942	0.856	0.785	0.927

DW MRI of CHOLESTEATOMA

5. NON-EPI>< DELAYED POST Gd T1: RESULTS

- ✓ Interobserver agreement
- ✓ Intraobserver agreement
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  - ✓Overall
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  - ✓Plot by Observer and Method
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DW MRI of CHOLESTEATOMA

5. RESULTS: Sensitivity - Specificity

Overall Sensitivity and Specificity by Method

	Sensitivity* (%)	Lower 95% confidence limit for Sensitivity	Upper 95% confidence limit for Sensitivity	Specificity (%)	Lower 95% confidence limit for Specificity	Upper 95% confidence limit for Specificity
Delayed post-Gd T1	56.7	49.2	63.8	67.6	53.0	79.4
non-EP DWI	82.6	74.8	88.3	87.2	69.0	95.4
Combined	84.2	76.7	89.6	88.2	70.7	95.8

* A significant interaction between observer and method was found (p=0.049)

DW MRI of CHOLESTEATOMA

5. RESULTS

- ✓ Interobserver agreement
- ✓ Intraobserver agreement
- ✓ Sensitivity – Specificity
  - ✓Overall
  - ✓Plot by Observer and Method
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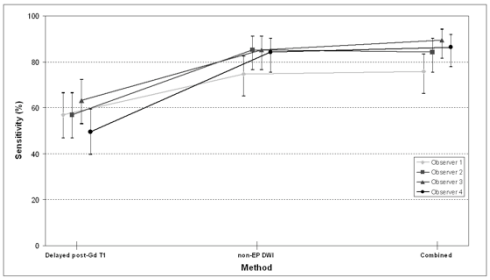
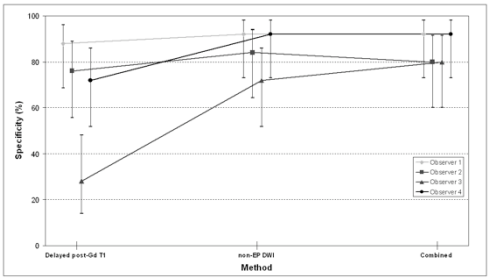
DW MRI of CHOLESTEATOMA

5. RESULTS: Sensitivity



DW MRI of CHOLESTEATOMA

5. RESULTS: Specificity



DW MRI of CHOLESTEATOMA

5. NON-EPI>< DELAYED POST Gd T1:RESULTS

- ✓ **Interobserver agreement**
- ✓ **Intraobserver agreement**
- ✓ **Sensitivity – Specificity**
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  - ✓**Plot by Observer and Method**
- ✓ **PPV – NPV**
  - ✓**Overall**
  - ✓**Plot by Observer and Method**
- ✓ **Difference in sensitivity and specificity by observer and method**

DW MRI of CHOLESTEATOMA

5. RESULTS: PPV - NPV

Overall Positive and Negative Predictive Values (95% CI) by Method

	PPV (%)	Lower 95% confidence limit for PPV (%)	Upper 95% confidence limit for PPV (%)	NPV*(%)	Lower 95% confidence limit for NPV (%)	Upper 95% confidence limit for NPV (%)
Delayed post-Gd T1	88.0	79.1	93.4	27.0	18.0	38.4
non-EP DWI	96.0	89.7	98.5	56.5	41.3	70.5
Combined	96.3	90.4	98.6	59.6	44.0	73.4

DW MRI of CHOLESTEATOMA

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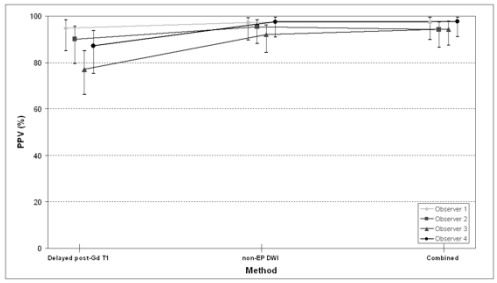
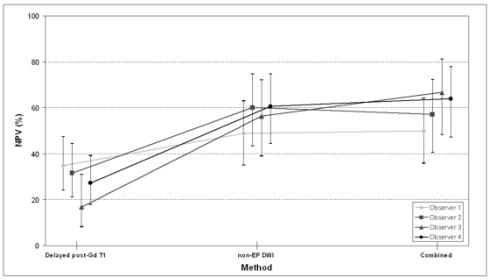
DW MRI of CHOLESTEATOMA

5. RESULTS: PPV



DW MRI of CHOLESTEATOMA

5. RESULTS: NPV



DW MRI of CHOLESTEATOMA

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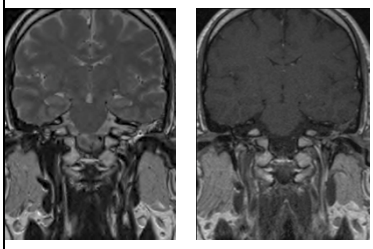
DW MRI of CHOLESTEATOMA

Value of nonEPI by cholesteatoma.
Differences in sensitivity and specificity by observers and by methods

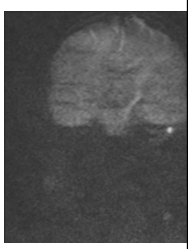
	Difference in sensitivity p-value	Difference in specificity p-value
Combined vs. delayed post-Gd T1	< 0.001	0.004
Combined vs. Non-epi	0.157	0.705
delayed post-Gd T1 vs. Non-epi	< 0.001	0.006

Adjusted p-value (Holm)

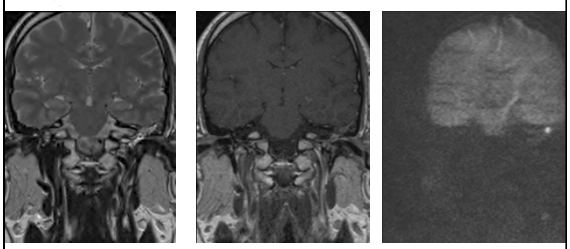
DW MRI of CHOLESTEATOMA



DW MRI of CHOLESTEATOMA



DW MRI of CHOLESTEATOMA



DW MRI of CHOLESTEATOMA

6. NON-EPI>< DELAYED POST Gd T1:CONCLUSIONS

DW MRI of CHOLESTEATOMA

6. NON-EPI>< DELAYED POST Gd T1:CONCLUSIONS

- ✓ **Delayed post-Gd T1-WI: lowest sensitivity, specificity, NPV and PPV**

DW MRI of CHOLESTEATOMA

6. NON-EPI>< DELAYED POST Gd T1:CONCLUSIONS

- ✓ **Delayed post-Gd T1-WI: lowest sensitivity, specificity, NPV and PPV**
- ✓ **No statistical significant difference between Delayed post-Gd T1-WI + non-EPI DWI and non-EPI DWI alone**

DW MRI of CHOLESTEATOMA

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- ✓ **Delayed post-Gd T1-WI: lowest sensitivity, specificity, NPV and PPV**
- ✓ **No statistical significant difference between Delayed post-Gd T1-WI + non-EPI DWI and non-EPI DWI alone**
- ✓ **MRI of cholesteatoma can be performed using non-EPI DWI alone**

DW MRI of CHOLESTEATOMA

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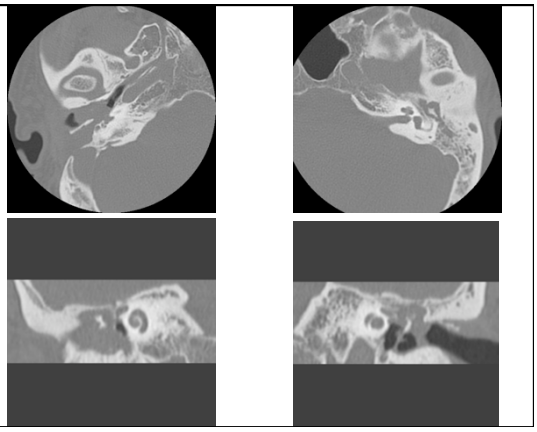
- ✓ **Delayed post-Gd T1-WI: lowest sensitivity, specificity, NPV and PPV**
- ✓ **No statistical significant difference between Delayed post-Gd T1-WI + non-EPI DWI and non-EPI DWI alone**
- ✓ **MRI of cholesteatoma can be performed using non-EPI DWI alone**

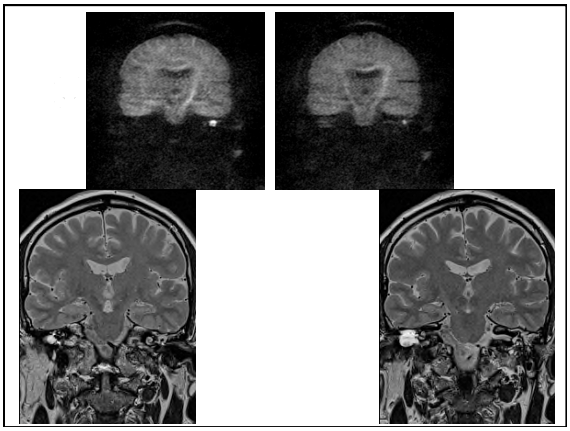
Middle Ear Cholesteatoma: Non-Echo-Planar Difusion-weighted MR Imagaing versus Delayed Gadolinium enhanced T1-weighted MR Imaging – Value in Detection
Bert De Foer, Jean-Philippe Vercruysse, Anja Bernaerts et al. Radiology. In press

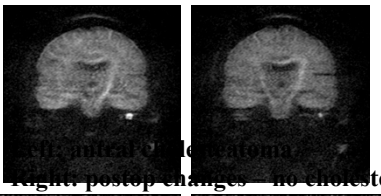
DW MRI of CHOLESTEATOMA

CASE 4:

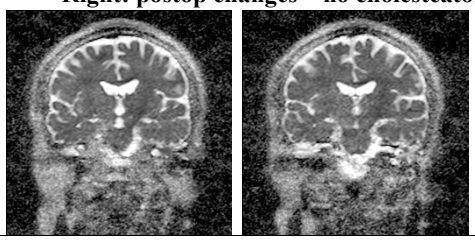
- ✓**44-year-old male**
- ✓**Prior history of cholesteatoma right side**
- ✓**Right canal wall up tympanoplasty**
- ✓**Ear discharge left side**
- ✓**Otoscopy: retraction pocket with cholesteatomatous debris left side**







Left: atical cholesteatoma
Right: postop changes – no cholesteatoma



CONCLUSIONS:

PRIMARY ACQUIRED CHOLESTEATOMA

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- ✓**1.Clinical straightforward cholesteatoma**

CONCLUSIONS:

PRIMARY ACQUIRED CHOLESTEATOMA

- ✓**1.Clinical straightforward cholesteatoma**
  - ✓**CT**

CONCLUSIONS:

PRIMARY ACQUIRED CHOLESTEATOMA
- ✓1.Clinical straightforward cholesteatoma
  - ✓CT
- ✓2.Clinical suspicion / doubtfull cholesteatoma

CONCLUSIONS:

PRIMARY ACQUIRED CHOLESTEATOMA
- ✓1.Clinical straightforward cholesteatoma
  - ✓CT
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  - ✓MRI screening using NON-EP

CONCLUSIONS:

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- ✓1.Clinical straightforward cholesteatoma
  - ✓CT
- ✓2.Clinical suspicion / doubtfull cholesteatoma
  - ✓MRI screening using NON-EP
- ✓3.Clinical suspicion an infected cholesteatoma

CONCLUSIONS:

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- ✓1.Clinical straightforward cholesteatoma
  - ✓CT
- ✓2.Clinical suspicion / doubtfull cholesteatoma
  - ✓MRI screening using NON-EP
- ✓3.Clinical suspicion an infected cholesteatoma
  - ✓MRI using NON-EP + delayed post-Gd T1WI

CONCLUSIONS:

PRIMARY ACQUIRED CHOLESTEATOMA
- ✓1.Clinical straightforward cholesteatoma
  - ✓CT
- ✓2.Clinical suspicion / doubtfull cholesteatoma
  - ✓MRI screening using NON-EP
- ✓3.Clinical suspicion an infected cholesteatoma
  - ✓MRI using NON-EP + delayed post-Gd T1WI
- ✓4.Clinical suspicion of complications

CONCLUSIONS:

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- ✓1.Clinical straightforward cholesteatoma
  - ✓CT
- ✓2.Clinical suspicion / doubtfull cholesteatoma
  - ✓MRI screening using NON-EP
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  - ✓MRI using NON-EP + delayed post-Gd T1WI

CONCLUSIONS:

PRIMARY ACQUIRED CHOLESTEATOMA

- ✓**1.Clinical straightforward cholesteatoma**
  - ✓**CT**
- ✓**2.Clinical suspicion / doubtfull cholesteatoma**
  - ✓**MRI screening using NON-EP**
- ✓**3.Clinical suspicion an infected cholesteatoma**
  - ✓**MRI using NON-EP + delayed post-Gd T1WI**
- ✓**4.Clinical suspicion of complications**
  - ✓**MRI using NON-EP + delayed post-Gd T1WI**
- ✓**CT scan in 2 + 3 + 4 in preoperative setting.**

CONCLUSIONS:

PRE SECOND LOOK CHOLESTEATOMA

CONCLUSIONS:

PRE SECOND LOOK CHOLESTEATOMA

- ✓**MRI = SCREENING TOOL**

CONCLUSIONS:

PRE SECOND LOOK CHOLESTEATOMA

- ✓**MRI = SCREENING TOOL**
  - ✓**NON-EP DW sequence b 0 - b 1000 – ADC**
  - ✓ **Ax + Cor TSE T2-weighted sequences**
  - ✓ **13 minutes**

CONCLUSIONS:

PRE SECOND LOOK CHOLESTEATOMA

- ✓**MRI = SCREENING TOOL**
  - ✓**NON-EP DW sequence b 0 - b 1000 – ADC**
  - ✓ **Ax + Cor TSE T2-weighted sequences**
  - ✓ **13 minutes**
- ✓**CT scan in PREOPERATIVE SETTING**

Thank you