Neck-MRI of victims of survived strangulation:

Evaluation of cases

C. Bruguier (1,2), J.B Zerlauth (2), F. Dédouit (1), J. Grimm (1,2), K. Michaud (1), P. Mangin (1), R. Meuli (2), S. Grabherr (1)

1) University Center of Legal Medicine Lausanne – Geneva, University Hospital Lausanne, Chemin de la Vulliette 4, CH-1000 Lausanne
2) Department of Diagnostic and Interventional Radiology, University Hospital Lausanne, Rue du Bugnon 46, CH-1011 Lausanne
Introduction

Examination of victims of survived strangulations is an important medico-legal issue

- To confirm an aggression
- To determine life-threatening of the victims
An external examination has to be carried out by the forensic pathologist

- Looking for visible lesions (*objective signs*) as:
  - petechiae (most relevant visible lesions for the forensic pathologist)
  - bruises
  - abrasions
Introduction

The pathologists take also in account clinical symptoms \textit{(subjective signs)} as:

- vision disorder
- voice disorder
- deglutination
- pain in muscles of the neck
Introduction
Introduction

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Source Internet
SIGNS AND SYMPTOMS OF STRANGULATION

NEUROLOGICAL
- Loss of memory
- Behavioral changes
- Loss of sensation
- Extremity weakness
- Headaches
- Feeling of being_asengers
- Headache

SCALP
- Peachae
- Bald spot (from head being pulled)
- Burning to the head (from blunt force
- Swelling

EYES & EYELIDS
- Peachae to mouth
- Peachae to eyelid
- Bloody red eyelid(s)
- Vision changes
- Droopy eyelid

FACE
- Peachae to face
- Peachae to ear(s)
- Scratch marks
- Facial swelling
- Swelling

MOUTH
- Breathing
- Swollen tongue
- Swollen lips
- Teeth
- Internal Peachae

CHEST
- Chest pain
- Redness
- Scratch marks
- Bruising
- Abrasions

NECK
- Redness
- Scratch marks
- Finger nail impressions
- Bruising (fingers or arms)
- Swelling
- Ligature Markings

VOICE & THROAT CHANGES
- Hoarse or hoarse voice
- Coughing
- Unable to speak
- Trouble swallowing
- Drooling
- Painful to swallow
- Coughing

BREATHING CHANGES
- Difficulty breathing
- Respiratory distress
- Unable to breathe


www.strangulationtraininginstitute.com
Introduction

• In some countries guidelines for the evaluation of these objective and subjective signs exist

• Some studies\textsuperscript{1,2} showed the advantage of neck-MRI to evaluate inner lesions as a help for determining life-threatening

1) Yen K & al. : Clinical forensic radiology in strangulation victims: forensic expertise based on magnetic resonance imaging (MRI) findings. Int J Legal Med. 2007 121:115-123.

Introduction

Encouraged by the results of those first studies, the University Center of Legal Medicine Institute (CURML), decided to propose a neck-MRI to victims of strangulation who presented:

• Objective signs:
  - petechiae
  - bruises, abrasions

• Clinical symptoms were also taking in account but no guideline was determined
Despite:

• A close collaboration with the department of radiology

• A cost-free examination for the victims

Only few victims were examined in 4 years (n=11)
Introduction

Aims of this study:

1. To evaluate the clinically examined victims of strangulation (n=112)

2. To identify clinical indicators leading to neck-MRI in living strangulation victims
Material and Methods

Study design:

• Case series
• Retrospective (from 1\textsuperscript{st} May 2009 to 31\textsuperscript{st} May 2013)

Inclusion criteria:

• Survived victims of strangulation

Exclusion criteria:

• Victims of aggression on the neck without strangulation
Data extracted from the report of clinical examinations:

• Objective lesions (*visible lesions*: petechiae - bruising - abrasions)

• Clinical symptoms (*subjective signs*: vision disorders - voice disorder - dysphasia - muscular neck pain)

Data extracted from the radiological reports:

• Findings of the neck-MRI
Material and Methods

• 3T device (Verio, Siemens, Erlangen, Germany)

MRI Unit of the Department of Diagnostic and Interventional Radiology, University Hospital Lausanne

• Sequences:
  • T1w axial - 3 mm
  • T2w axial - 3 mm
  • T2w fat/sat axial – 4mm
  • T2w STIR axial – 4 mm
  • T2w STIR coronal – 4 mm
Results

• Age: 5 – 85 years [median 32]

• Gender: 93 females
   19 males

• Time interval: aggression - MRI = 24h – 120h [median 48]
Results

Victims evaluated

112

- No MRI proposed: 99
- MRI proposed: 13
  - Refused: 1
  - Not presented: 1
  - MRI performed: 11
    - Findings: 7
    - No findings: 4

Results: 23/05/2016
Results

4 groups of victims were observed

Group (1): petechiae & clinical symptoms

Group (2): bruising, abrasions, +/- clinical symptoms

Group (3): only clinical symptoms

Group (4): no objective lesions & no clinical symptoms
# Results

<table>
<thead>
<tr>
<th>Objective lesions</th>
<th>Clinical symptoms</th>
<th>MRI proposed</th>
<th>Radiological findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>112</td>
<td>76</td>
<td>10 (-)</td>
<td>2 (+)</td>
</tr>
<tr>
<td>Petechiae (Gr1)</td>
<td>8</td>
<td>9</td>
<td>2 (+)</td>
</tr>
<tr>
<td>Bruising, abrasions (Gr2)</td>
<td>86 (+)</td>
<td>100</td>
<td>2 (+)</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>100</td>
<td></td>
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<tr>
<td></td>
<td>19 (+)</td>
<td>0</td>
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<tr>
<td></td>
<td>9 (-)</td>
<td>0</td>
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</tr>
</tbody>
</table>

* 23/05/2016

* (-) 1 x refused
* (-) 1 x not presented
Results

T1w

T2w

23/05/2016
Results

T2w

T2w fat/sat
Discussion

• MRI showed pathological findings in 36% (4/11) of the victims who underwent a neck-MRI

  BUT

• Group 1:

  4 cases were not MRI documented even the presence of petechiae
Discussion

• **Group 2:**
  9 cases were proposed an neck-MRI on the 66 victims presented the same clinical symptoms!
  Potentially **13** cases could have been positive, if MRI documented
  (statistical simulation: 66-9= 57 x 22% -> 13)

• **Group 3:**
  Possible internal lesions without presence of objective signs?
Discussion

• In the CURML: The forensic pathologists do not follow a clear procedure to propose an MRI to the victims since victims presented the same clinical medical table.

• The medical interpretation of the subjective signs is clearly a problem and recognized guidelines are difficult to establish.
Discussion

• Impact of the number of cases potentially not or weak documented:

  ➢ Realize the potential of the neck-MRI in addition to their clinical examination

  ➢ Reflections on the procedure to propose the neck-MRI
Conclusion

This study shows that neck-MRI is useful for the evaluation of victims of strangulation.

But Strict indications should be delineated.
Conclusion

New procedure in the CURML (taking into account the cost of the neck-MRI & new neck-MRI protocol)

Each victims with:

- Presence of petechiae
- Presence of bruises – abrasions and clinical symptoms

A neck-MRI is proposed
Thank you for your attention