

XXXème Congrès de l'Association Française d'Identification Odontologique

Analyse tridimensionnelle des traces de morsures : utilisation d'une caméra optique

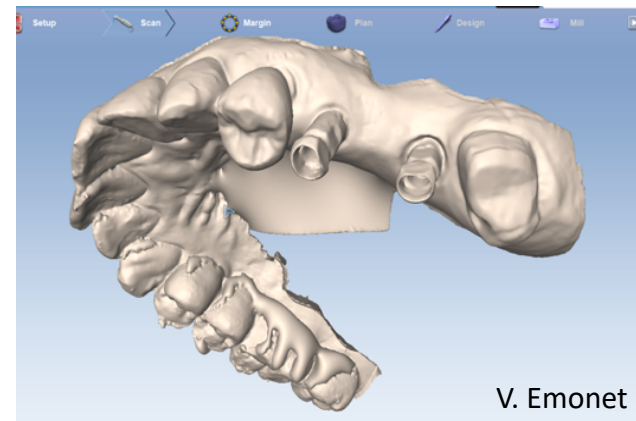
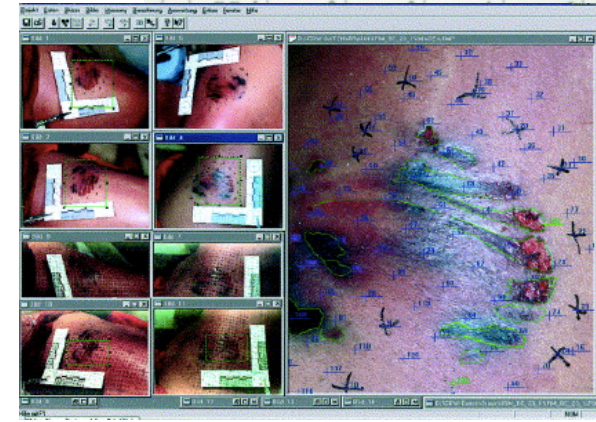
Géromine Fournier

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Introduction

- Identifier un coupable
- Photographie
- Conservation de l'aspect 3D :
 - Photogrammétrie
 - Caméra intra-orale :

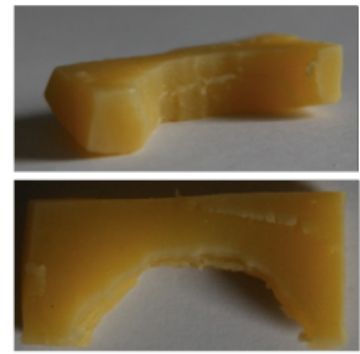


Objectifs

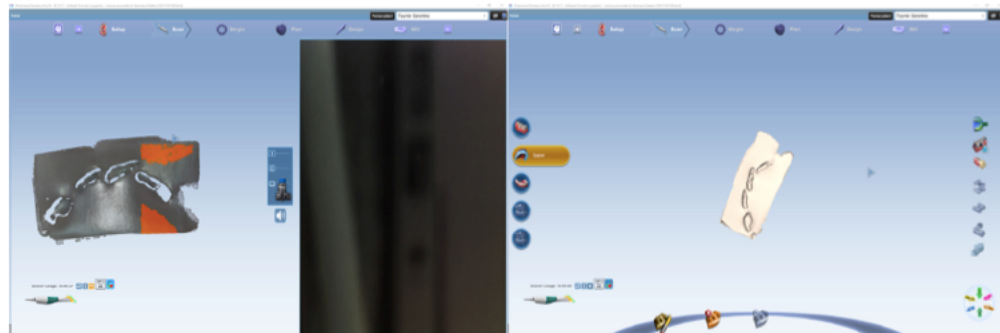
- Valider notre protocole
- Tester sur différents supports
- Evaluer la reproductibilité et la fiabilité

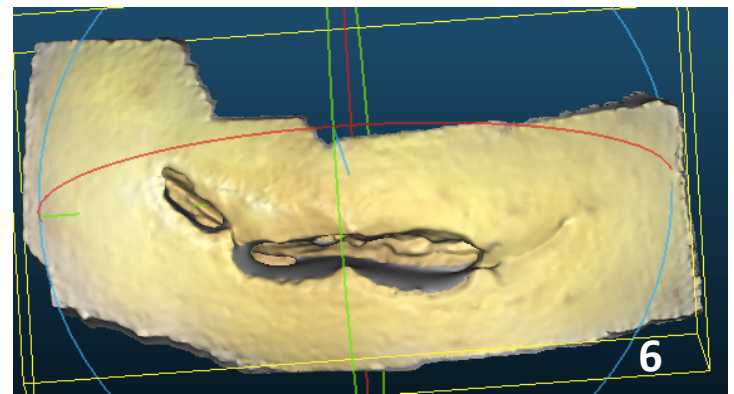
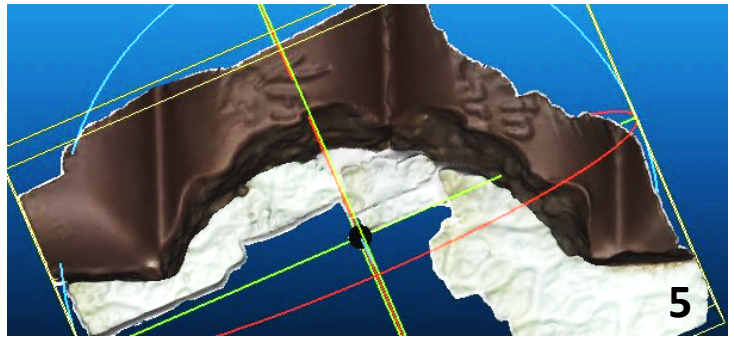
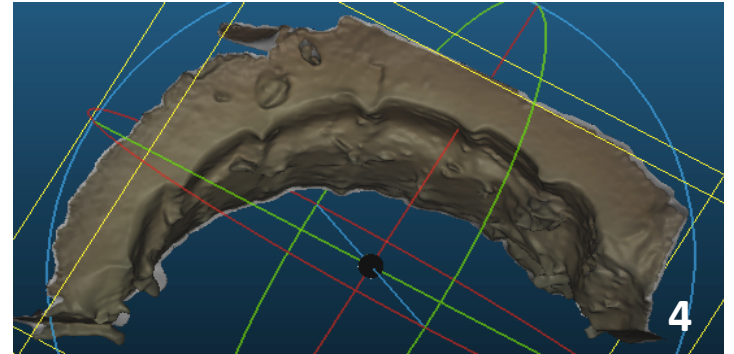
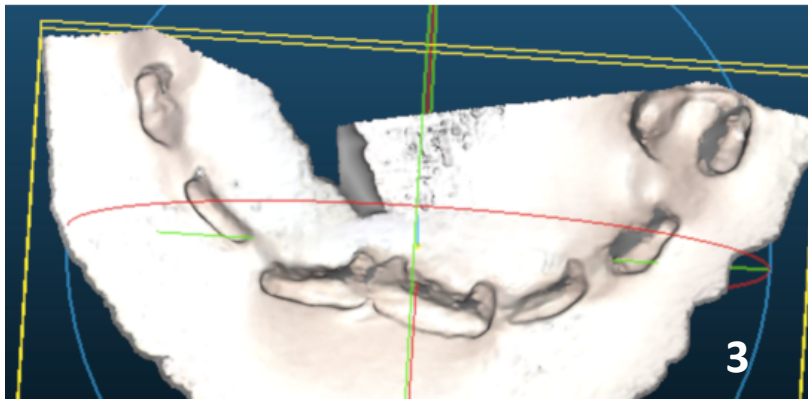
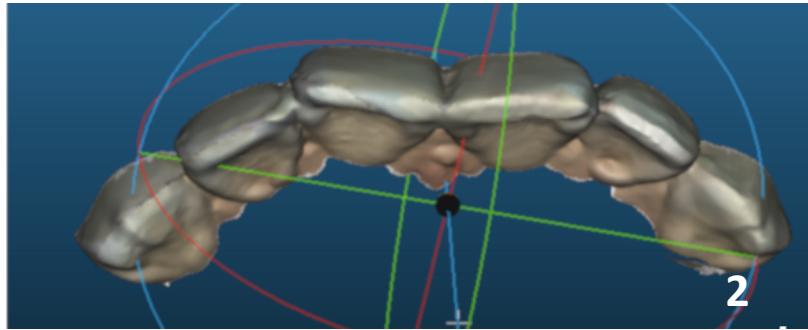
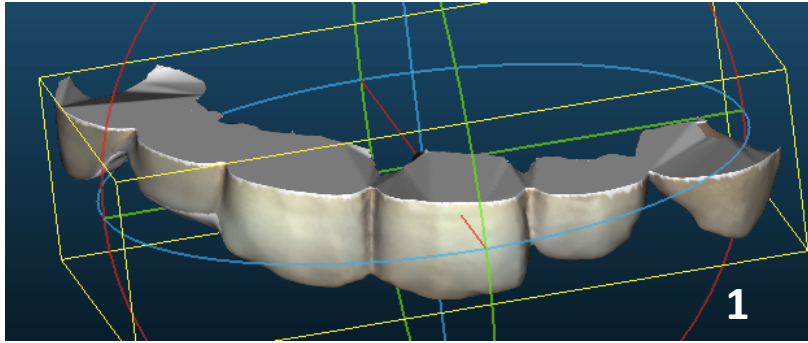
Matériel

- 27 volontaires
- 4 supports :
 - Cire
 - Fromage
- PlanMeca Emerald et Romexis
 - Erreur intrinsèque : 0.035 mm
- MeshMixer et CloudCompare



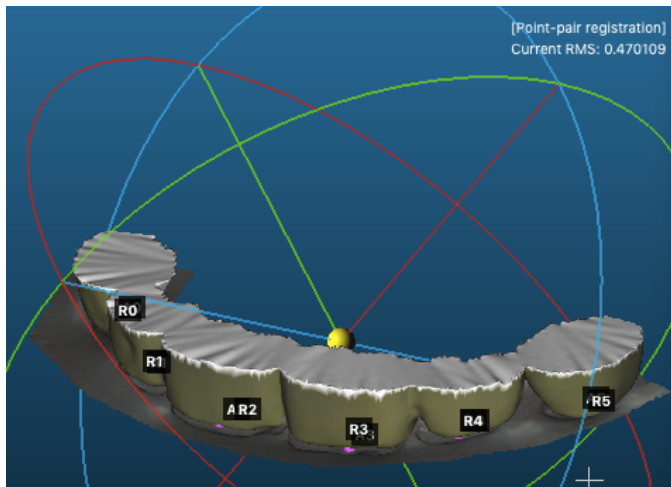
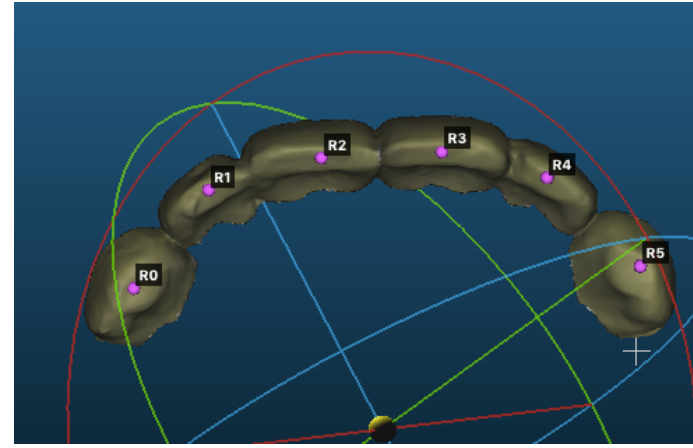
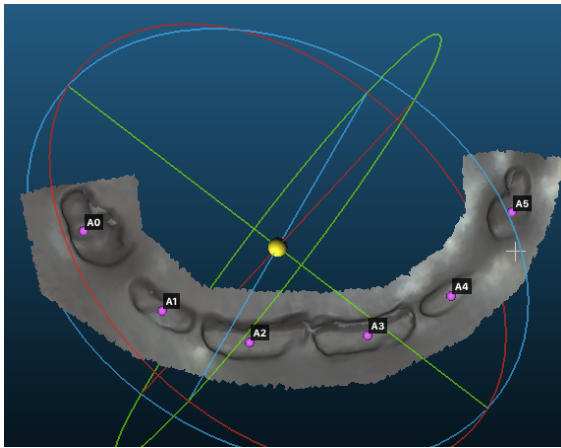
- Chocolat
- Pomme





Méthodologie (1)

- Points de repères et alignement :



☒ show 'to align' cloud ☒ show 'reference' cloud

$r = 8.000$ RMS < 3%

	X	Y	Z	Error	
A0	0.504228	1.671805	2.367374	0.427511	✗
A1	1.462790	-6.117958	5.150590	0.295566	✗

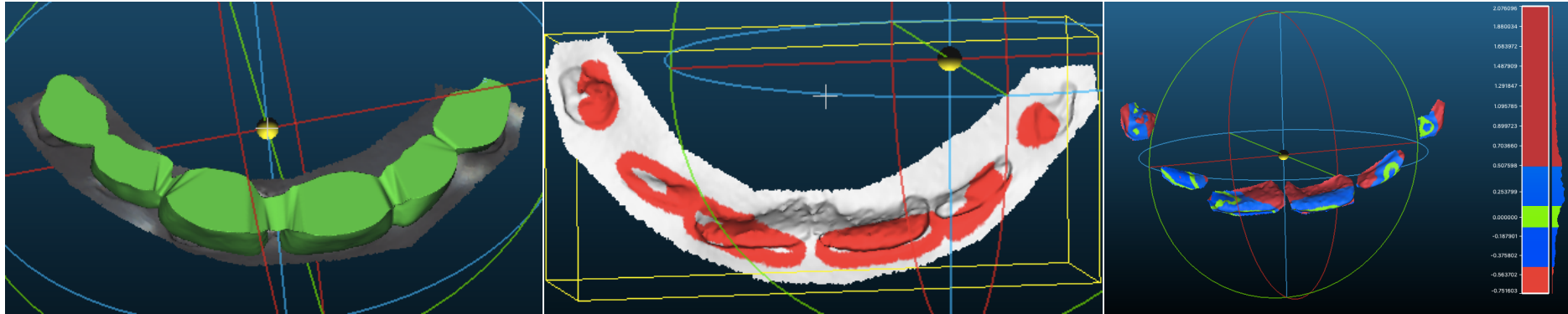
	X	Y	Z	Error	
R0	1.055099	-4.765270	15.402772	0.427511	✗
R1	3.125080	-11.2042...	18.161903	0.295566	✗

☒ adjust scale Rotation: XYZ ☒ Tx ☒ Ty ☒ Tz

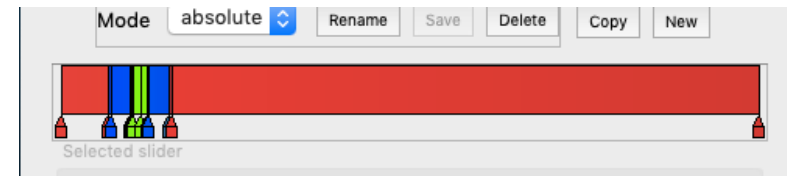
☒ auto update zoom align reset ✓ ✗

Méthodologie (2)

- Comparaisons :



- Echelle colorimétrique :
Vert < 0.1 mm
0.1 mm < Bleu < 0.5 mm
Rouge > 0.5 mm

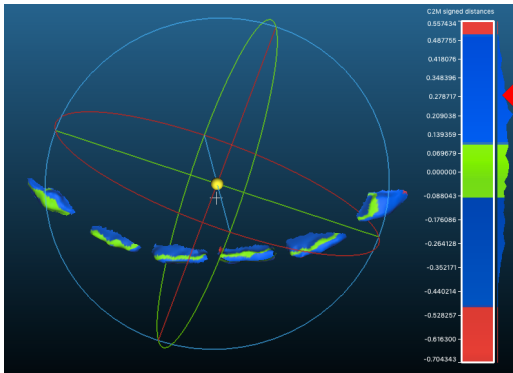
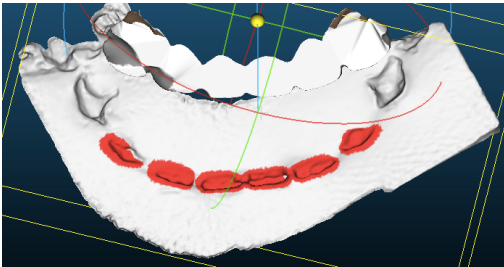
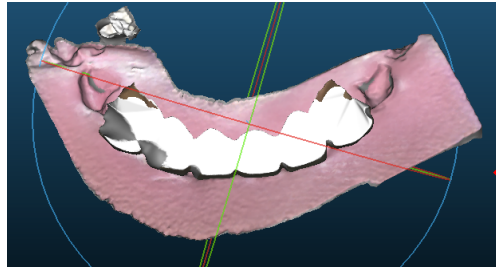


Méthodologie (4)

- **Comparaisons des support mordus :**
 - Même expérimentateur
 - 256 morsures de chaque support
- **Fiabilité et reproductibilité :**
 - 4 observateurs : dentiste, étudiant en odontologie, médecin légiste, policier
 - 50 comparaisons de morsures sur cire
- **Analyse statistique :**
 - Valeur prédictive (VPP et VPN)
 - Coefficient Cohen de Kappa

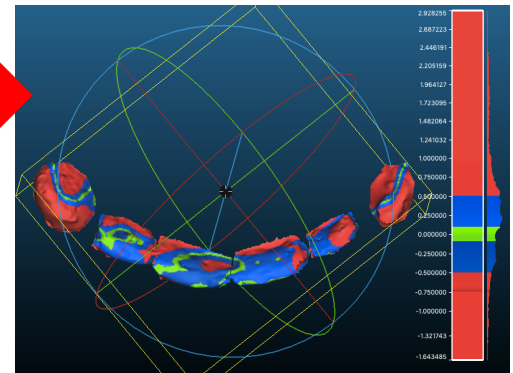
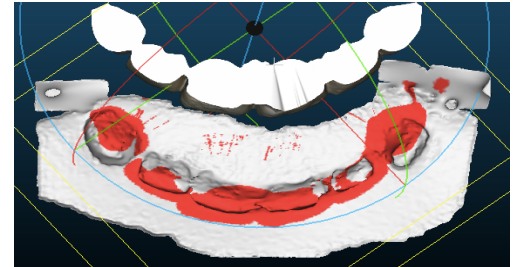
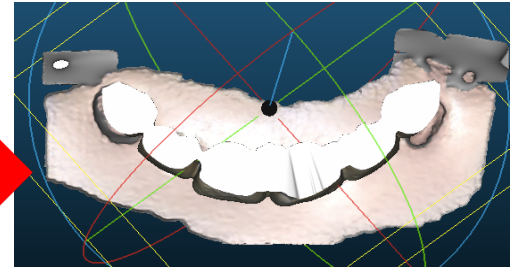
Résultats (1)

Mandibule



MATCH

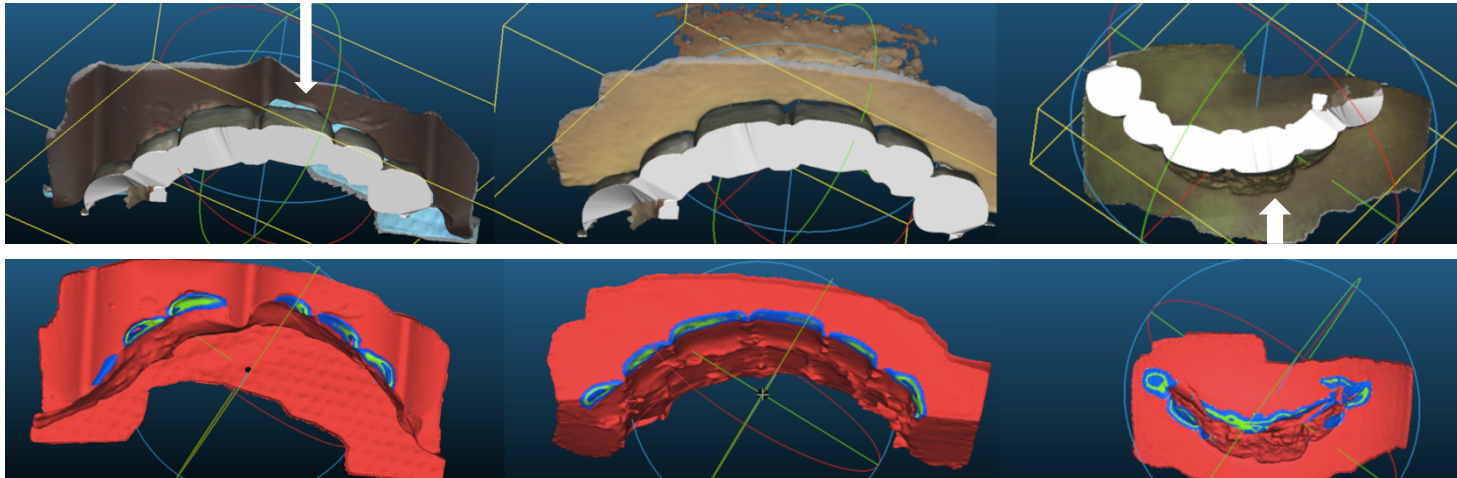
Maxillaire



NON MATCH

Résultats (2)

- Comparaisons des supports mordus :



- Valeurs prédictives :

	Cire	Fromage	Chocolat	Pomme
VPP (%)	87.1	75.8	70.6	57.1
VPN (%)	100	99.1	98.7	98.6

Résultats (4)

- Inter-observateurs :

- Valeurs prédictives morsures sur cire

	Chirurgien Dentiste	Etudiant en dentaire	Médecin légiste	Policier
VPP (%)	100	100	70.6	81.8
VPN (%)	95	95	100	92.3

- Coefficient Cohen de kappa :

- Très bonne concordance entre dentiste et étudiant en odontologie ($\kappa = 0.84$)
- Bonne concordance entre chaque observateur ($\kappa > 0.61$)

Discussion (1)

- Echelle colorimétrique :
 - Seuil de 0.1 mm
- Volontaires :
 - 78% traitement orthodontique
 - Peu de malpositions dentaires

Discussion (2)



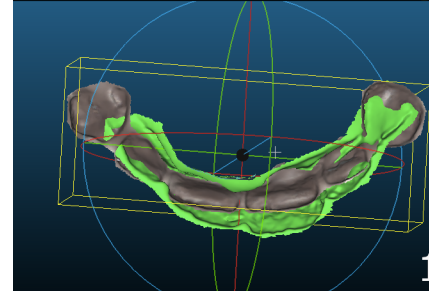
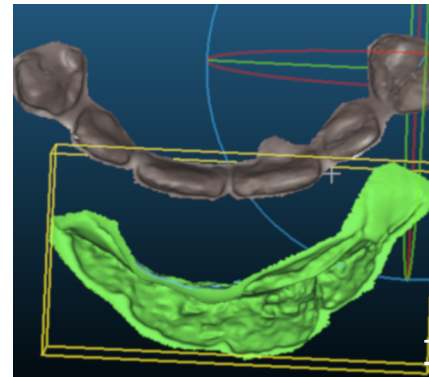
- Classification des matériaux :

- Cire > Fromage > Chocolat > Pomme

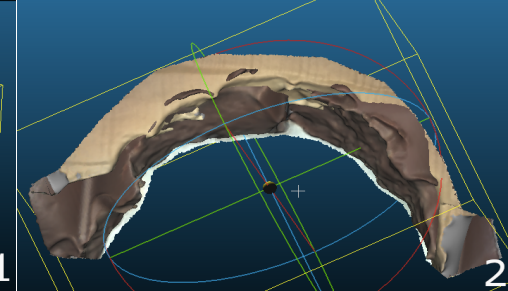
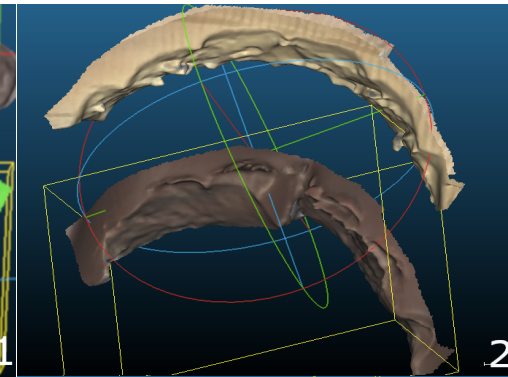
- Morsures dependent :

- Supports mordus
- Force de la morsure

Cire et pomme
(vert)



Fromage et
chocolat



Discussion (3)

- **Inter-observateurs :**
 - Pas d'entraînement préalable
 - Bonne concordance entre chaque observateur
 - Reproductibilité
- **Expérience en odontologie :**
 - Meilleurs résultats pour dentiste et étudiant en odontologie
 - Autres études :
 - Photographie (Whittaker 1998, Reesu 2016)
 - Scanner de surface (Corte-Real 2018)

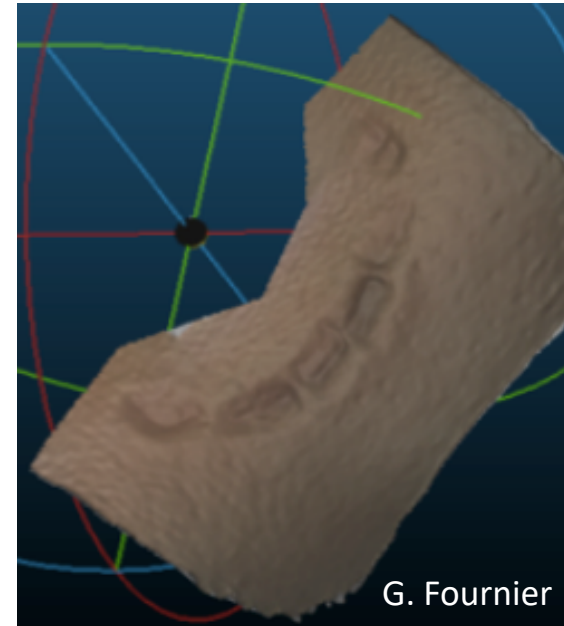
Whittaker D.K, Brickley M.R, Evans L. A comparison of the ability of experts and non-experts to differentiate between adult and child human bite marks using receiver operating characteristic (ROC) analysis Forensic Sci Int 1998

Reesu GV, Brown NL. Inconsistency in opinions of forensic odontologists when considering bite mark evidence Forensic Sci Int 2016

Corte-Real A, Pedrosa D, Saraiva Tri-dimensional pattern analysis of foodstuff bitemarks - A pilot study of tomographic database Forensic Sci Int 2018

Conclusion

- Approche 3D
- Fiable et reproductible
- Possibilité d'enregistrer morsures sur la peau ?



Merci



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