

## POOR DENTAL HEALTH AND CRUSHED DRUGS IN NURSING HOME RESIDENTS

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**Abstract:** Some older adults with a poor dental state, but not suffering from swallowing disorders (dysphagia), could be given crushed drugs unnecessarily, just because they are given texture modified food. Thirty-nine residents were included in this analysis of nursing home practices: mainly women (28/39); mean age 86.8 +/-7.7; Groupe Iso-Ressource (GIR) 1.7 +/- 0.6; Mini Mental State (MMS) 16.5 +/- 6.0; crushed drugs 26/38; swallowing disorders 14/39; mixed and mashed food 25/38. Crushed drugs were associated with mixed and mashed food ( $P = 0.001$ ), male gender ( $P = 0.008$ ) and lower mastication ability ( $P = 0.015$ ), but not with swallowing disorders ( $P = 1$ ). Seventeen patients not recorded as having swallowing disorders were given crushed drugs. In conclusion, a poor dental health is frequently but not systematically related to swallowing disorders. This is not an indication for crushing drugs, because tablets and capsules don't have to be chewed before being swallowed.

**Key words:** Crushed drugs, dysphagia, dental state, swallowing disorders, texture modified food.

### Introduction

Nursing homes residents are often given mixed or mashed food because they suffer from poor dental state (1) or swallowing disorders (dysphagia) (2, 3). Eight levels of texture modified food and/or thickened liquids are adapted, ranging from regular diet (level 7: regular and regular easy to chew) to severe dysphagia (level 0) (4). Additionally, when patients suffer from swallowing disorders or cognitive impairment, it is also necessary to crush tablets and to open capsules because there is a risk of choking, potentially lethal. Crushed drugs are secondly mixed into soft food or thickened beverage, and nurses' aides give them with a spoon (5). However, many drugs are not to be crushed and others should be crushed and given separately, but it is not always easy to follow these recommendations (6, 7). Many crushed drugs have a bitter taste - leading to drug refusal - and spoil the appetite (8), and many have unwanted antimicrobial effects (9). For all these reasons, unnecessary drug crushing should be avoided.

Besides, tablets and capsules don't need to be chewed before being swallowed. The problem at stake is that some older adults displaying a poor dental state, but not suffering from swallowing trouble, could be unnecessarily given crushed drugs, just because they are given mixed and mashed food. The research question was to find out a possible link between crushed drugs and poor dental health, rather than dysphagia, in nursing home residents.

### Methods

This analysis of crushing drug habits in nursing home residents was carried out at the private geriatric hospital Les Sources, Nice, France. The project was validated by the Ethics Committee of the institution. For this pilot study, the physician in charge of the geriatric ward included the 46 patients of a nursing home unit. There was no inclusion criteria, because it was an observation study of food and drugs delivery habits. At this stage, there was no power evaluation. Medical data were anonymously retrieved from patients' medical charts. Out of 46 residents' files, seven were excluded because oral examination had been impossible.

Four main criteria were evaluated: i) crushed drugs, ii) swallowing disorders, iii) cognitive impairment and iv) mixed or mashed food ("yes" vs "no"). Characteristics of "yes" groups were compared to "no" groups. Medical data have been recorded by the ward physicians. Some oro-dental data have been routinely recorded by nurses: daily number of brushings of teeth / cleanings of the mouth, regular use of antiseptic mouthwashes, visible microbial deposits in the mouth, dental pain, wearing one or two removable dentures. Swallowing disorders had been diagnosed by the speech therapist. Eating difficulties as a consequence of missing teeth had been recorded by the dietician. Diet was supervised by the dietician, working with cooks. For this study, the dental-surgeon recorded: periodontitis, oral dryness, oral candidiasis symptoms, DMFT index (decayed, missing, filled teeth), patients needing a scaling, dental filling, teeth to be extracted or new removable dentures and assessed masticatory ability (10). Masticatory ability is a dental index adapted to frail older adults (11).

**Table 1**

Characteristics of patients who were given crushed drugs, suffering from swallowing disorders or who were given mixed-mashed food. In italics: borderline significance

<b>Crushed drugs</b>			
<b>Mean or % (n)</b>	<b>Yes N = 26</b>	<b>No N = 12</b>	<b>P value</b>
Mixed and mashed food	84.6% (22)	25.0% (3)	0.001
Men	42.3% (11)	0% (0)	0.008
Masticatory ability (in %)	22.0 ± 24.6 (26)	45.2 ± 28.8 (12)	0.015
Needing a scaling	65.4% (17)	100% (12)	0.036
MMS* (Mini Mental State)	15.7 ± 6.4 (26)	18.8 ± 4.5 (12)	<i>0.068</i>
DMFT index† (Decayed, Missing, Filled Teeth)	20.2 ± 6.7 (26)	16.0 ± 6.4 (12)	<i>0.076</i>
Difficulties for eating resulting from missing teeth	73.1% (19)	41.7% (5)	<i>0.081</i>
BMI‡ (Body Mass Index, kg/m <sup>2</sup> )	22.2 ± 4.0 (26)	24.9 ± 5.6 (12)	<i>0.093</i>
<b>Swallowing disorders</b>			
	<b>Yes N = 14</b>	<b>No N = 25</b>	<b>P value</b>
BMI‡ (kg/m <sup>2</sup> )	21.1 ± 3.0 (14)	24.2 ± 5.0 (25)	0.042
Needing new dentures	85.7% (12)	52.0% (13)	0.044
<b>Mixed and mashed food</b>			
	<b>Yes N = 25</b>	<b>No N = 13</b>	<b>P value</b>
Masticatory ability	17.0% ± 20.4 (25)	53.1% ± 25.0 (13)	< 0.001
Difficulties for eating resulting from missing teeth	84.0% (21/25)	23.1% (3/13)	< 0.001
Crushed drugs	84.0% (21/25)	30.1% (4/13)	0.003
Decayed, missing, filled teeth DMFT index†	20.9 ± 6.1 (25)	14.9 ± 6.4 (13)	0.008
Masticatory ability < 70%	100% (25/25)	69.2% (9/13)	0.009
Masticatory ability = 0%	52.0% (13/25)	7.7% (1/13)	0.012
Needing new dentures	76.0% (19/25)	38.5% (5/13)	0.035
Regular mouthwash use	28.0% (7/25)	0% (0/13)	<i>0.072</i>

\*MMS: ranging from 30 (normal) to 0; values less than 24: suspicion of altered state of consciousness; †DMFT index: ranging from 0 (no decayed, missing of filled teeth) to 32 (32 decayed, missing of filled teeth); ‡BMI: for adults >20 years, underweight: BMI is less than 18.5; normal weight: BMI is 18.5 to 25; overweight: BMI is 25 to 30; obese: BMI is 30 or more

For every patient, we secondly looked for potential associations among the four main criteria and other patients' characteristics. For qualitative variables, the Chi-2 test was used or replaced by the exact test of Fisher for small samples (n<5). For quantitative variables, the Student's T test was used (software: BiostaTGV). Statistical significance was accepted at 5% (P<0.05). Only significant or borderline associations are reported below.

## Result

### Patients included in the study

Among the 39 included patients, the two variables «crushed drugs» and «mixed or mashed food» were not available for two patients.

In this nursing home unit, patients' mean values or proportions were as follows: age 86.8 +/-7.7 years; weight

61.4 +/- 13.7 kg; Body Mass Index (BMI) 23.1 +/- 4.6 kg/m<sup>2</sup>; albuminemia 37.4 +/-3.4 g/L; C Reactive Protein (CRP) 16.2 +/- 19.6 mg/L; Groupe Iso-Ressource (GIR: frailty index ranging from 1 to best score 6) 1.7 +/- 0.6; Mini Mental State (MMS, best score 30) 16.5 +/- 6.0; current episode of bedsores 2/39; current episode of diarrhea 9/39; crushed drugs 26/38; swallowing disorders 14/39; mixed and mashed food 25/38; protein rich diet 14/39; brushing of the teeth / cleaning of the mouth 1.2 +/-0.5 times daily; regular use of antiseptic mouthwashes 7/39; periodontitis 18/39; visible microbial deposits in the mouth 31/39; dental pain 12/39; oral dryness 26/39; eating difficulties as a consequence of missing teeth 25/39; wearing one or two removable dentures 11/39; needing new removable dentures 25/39; DMFT index (Decayed, Missing, Filled Teeth) 18.8 +/- 6.7; mastication ability (0% to 100% best score) 29.6 +/- 27.5%; masticatory ability < 70% (chewing impairment) 35/39 ; mastication ability equal to 0%

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(fully edentulous or no pair of opposite teeth) 14/39; patients with teeth to be extracted 22/39; needing a scaling 30/39; oral candidiasis 8/39 and decayed teeth needing a filling 12/39. Evaluation of mastication performance can be also determined with color-changeable chewing gum (12).

### **Crushed drugs**

The main characteristics of patients who were given crushed drugs are detailed in Table 1. The use of crushed drugs has two indications: swallowing disorders and cognitive impairment (2, 3). However, in this study, lower MMS and poor dental state (more frequent use of mouthwashes, lower masticatory ability, fewer teeth, higher DMFT index and more difficulties to eat because of missing teeth) were prominent indications for taking crushed drugs, but not swallowing disorders (9/26 vs 4/12;  $P = 1$ ). In particular, masticatory ability of residents who were given crushed drugs was lower than masticatory ability of residents who were not given crushed drugs ( $22.0 \pm 24.6\%$  ( $n = 26$ ) vs  $45.2 \pm 28.8\%$  ( $n=12$ );  $P = 0.015$ ). So, patients displaying a poor dental state were given mixed and mashed food and, as a consequence, crushed drugs.

### **Swallowing disorders**

Swallowing disorders were directly linked to feeding difficulties with loss of weight and decreased BMI (Table 1). Resulting malnutrition is frequent (1-3), and in addition to the risk of choking during meal it is often difficult to design new dentures (10). Actually, it may be impossible to take impressions, because there is a risk of choking with impression paste (13, 14). However, in the present study, a total of 17 patients who did not suffer from swallowing disorders were given crushed drugs, while 14 out of these 17 patients were given mixed and mashed food.

### **Cognitive impairment**

A first analysis compared the group of patients with a MMS  $< 15$  ( $n = 11$ ; mean MMS  $10.0 \pm 4.0$ ) to the group of patients having a MMS  $> 15$  ( $n = 21$ , mean MMS  $20.0 \pm 3.5$ ). In the group of residents who had the lowest MMS, there were no more crushed drugs than in the other group (8/11 vs 12/21;  $P = 0.465$ ), no more swallowing disorders (3/11 vs 8/21;  $P = 0.703$ ), and no more mixed or mashed food (8/11 vs 13/21;  $P = 0.703$ ).

A second analysis compared the group of the patients with a MMS  $< 16$  ( $n = 16$ ; mean MMS  $11.9 \pm 4.4$ ) to the group of the patients having a MMS  $> 16$  ( $n = 16$ , mean MMS  $21.2 \pm 3.1$ ). Results were similar. In the group of residents who had the lowest MMS, there were no more crushed drugs than in the other group (12/16 vs 8/16;  $P = 0.273$ ), no more swallowing disorders (6/16 vs 5/16;  $P = 1$ ), and no more mixed or mashed food 11/16 vs 10/16;  $P = 1$ ).

## **Discussion**

The present results confirmed the study hypothesis: a poor oral state not combined with swallowing disorders should not be an indication for crushing drugs. The first limit of this study is the low patient enrolment, limited to 39 subjects, which did not show a link between mixed and mashed food and swallowing disorders. However, it showed that dental state, rather than swallowing disorders, was linked to the choice of a mixed and mashed food and consequently to the use of crushed drugs in food (Table 1). The second limit to this study is that IDDSI descriptions of texture modified foods and thickened liquids had not been recorded (4). The criterion "mixed or mashed food" corresponds to IDDSI levels 6 to 4, but anyway the present analysis lacks of precision.

In the present series, cognitive impairment was not specifically associated to swallowing disorders, and it was not the main indication for crushing drugs or mixing food (6, 7). This work showed that nursing staff takes the greatest care to avoid any risk of choking with food and drugs (13). But another possibility would be that nursing staff tends to routinely crush drugs whenever the patient is given soft food. In order to avoid excessive crushing, these results demonstrated the need for speech therapists, dieticians and dental surgeons in care facilities for older people, as well as the need for a multidisciplinary approach and re-evaluation in order to avoid empiric decision to crush drugs (14, 15).

## **Conclusion**

We observed that nursing home residents suffering from dental impairment such as missing teeth, low masticatory ability and needing new dentures were generally given mixed and mashed food. We also observed that patients who had soft food were given crushed drugs mixed in the food. From these results, it cannot be excluded that some patients, who did not suffer from swallowing disorders or severe cognitive impairment, were given crushed drugs only because of their poor dental state (lower masticatory ability, more missing teeth and needing new dentures). Nevertheless, tablets or capsules are supposed to be swallowed, not chewed. Therefore, crushing drugs should be limited to people suffering from swallowing disruptions. A frequent re-evaluation of dental status, dysphagia and choking risks is time-consuming for the medical and nursing staff, but crushing drugs is time-consuming too for nurses and nurses' aides. Besides, limiting this practice would also contribute to improving the quality of frail older adults' daily lives, because several crushed drugs have a very bitter taste, persistent, spoiling food taste and meals pleasure.

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