

Original Article

Are Opioid Patches A Patient Safety Issue in Emergency Medicine? - A Forensic Point of View -

Buschmann C^{1*}, Tsokos M¹ and Marung H²¹Institute of Legal Medicine and Forensic Sciences, Charité – Universitätsmedizin Berlin, Germany²Institute of Emergency Medicine, Asklepios Kliniken Hamburg GmbH, Germany

*Corresponding author

Buschmann, Charité – Universitätsmedizin Berlin, Institute of Legal Medicine and Forensic Sciences, Turmstr. 21, Building N, 10559 Berlin, Germany, Tel: 49 30 450 525 – 216; Fax: 49 30 450 525 – 931; Email: claaas.buschmann@charite.de

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Keywords

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- Safety
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- Accidental poisoning

Abstract

Background: Transdermal administration of opioids, especially of fentanyl patches, is common, and its use increases. However, there is a relevant risk of misuse. Few cases have been reported from the pre-hospital setting. We investigated whether forensic data indicate a pre-hospital threat to patient safety by transdermal opioid application systems.

Material and methods: We reviewed 2,019 autopsies for opioid patches, subsequent toxicological findings, and emergency treatment prior to death.

Results: 15 deceased (0.74%) presented opioid patches at autopsy, 14 with one patch applied (average dose 49.4 µg/h, range 12 - 100 µg/h). 4 patients were treated by emergency staff prior to death, i. e. cardiopulmonary resuscitation (CPR). Elevated or fatal opioid doses were not found.

Conclusion: In contrast to previous studies, we found no evidence of improper handling of opioid patches. However, the significance of our study is limited. More and wide-spread epidemiologic data will be gained from a forthcoming interdisciplinary cooperation between forensic and clinical institutions.

INTRODUCTION

Transdermal systems for application of analgesics (fentanyl / buprenorphine) has improved the quality of care of chronic pain patients in the last two decades, and transdermal administration of opioids, primarily of fentanyl, is increasing worldwide [1,2]. The “first pass effect” is bypassed with transdermal administration, and the liberation of the active agent is continuously guaranteed when used correctly. The “pain patches” are easier to handle than long-term oral medication, but for maintenance of the gradient that allows the absorption for a period up to three days, the transdermal systems contain large opioid amounts (e. g., 7.2 mg fentanyl in a 100 µg patch, table 1), and a relevant quantity of opioids still remains in the patches after use.

Potential risks are respiratory depression, but also illegal consumption of transdermal fentanyl patches (oral / intravenous), resulting in fatal outcome due to poor controllability (Figure 1) [3-6]. Nevertheless, initial prescription of fentanyl patches is often not established under hospital surveillance, but in outpatients – to an increasing extent also in patients without previous oral

opioid treatment and without disturbances of oral intake or enteral absorption [1]. Sometimes multiple patches are used (in individual cases > 300 µg/h). In emergency care for fentanyl intoxication, short half-life of the antidote naloxone in relation to long half-life of fentanyl, and (after patch removal) persistent fentanyl absorption for about 12 hours is important. While fentanyl intoxications are recognized as a relevant problem in forensic literature [7,8], emergency medicine reports on fentanyl intoxications are sparse, especially in non-drug-addict patients [9].

Fentanyl intoxications can be diagnosed and treated easily; we investigated whether opioid patches contains a risk regarding patient safety and whether transdermal fentanyl administration is of importance in unsuccessful pre-hospital CPR as non-addressed potential reversible cause of cardiac arrest.

MATERIAL AND METHODS

From 2011-01-01 to 2012-12-31, all autopsies (n=2,019) at our institute were analyzed regarding presence and amount of opioid patches, subsequent toxicological findings,

Table 1: Dose-dependent liberation and after-use remaining quantities of fentanyl patches; dosages and respective agent quantity were obtained from patient information leaflets, liberation and agent quantity after 72 hours were calculated.

| dosage µg/h | quantity (mg) | liberation mg/72 h | quantity after 72 hours (mg) |
|----------------|------------------|-----------------------|---------------------------------|
| 12 | 2.1 | 0.9 | 1.2 |
| 25 | 4.2 | 1.8 | 2.4 |
| 50 | 8.4 | 3.6 | 4.8 |
| 75 | 12.6 | 5.4 | 7.2 |
| 100 | 16.8 | 7.2 | 9.6 |

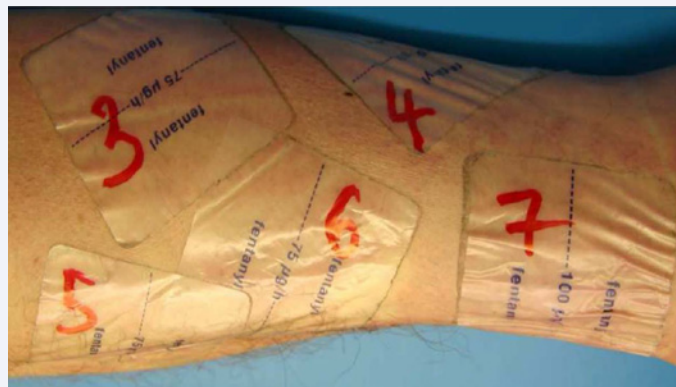


Figure 1 Misuse of fentanyl patches (autopsy).

Table 2: Deaths with fentanyl patches at postmortem examination prior to autopsy (n=15).

| no. | sex | age (years) | no. of opioid patches | dosage (single-) patch (µg/h) | treatment by emergency medical staff? | CPR? | cause of death |
|-----|-----|----------------|--------------------------|----------------------------------|--|------|---------------------------|
| 1 | m | 61 | 1 | 25 | - | - | cardiac death |
| 2 | m | 72 | 1 | 75 | - | - | multi organ failure |
| 3 | f | 85 | 2 | 100 | - | - | polytrauma |
| 4 | m | 84 | 1 | 50 | - | - | cardiac death |
| 5 | f | 82 | 1 | 75 | + | - | pneumonia |
| 6 | m | 72 | 1 | 25 | - | - | pulmonary embolism |
| 7 | f | 77 | 1 | 25 | - | - | bolus death |
| 8 | f | 97 | 1 | 50 | - | - | fat embolism |
| 9 | m | 71 | 1 | 75 | - | - | two-timed splenic rupture |
| 10 | f | 72 | 1 | 25 | - | - | cardiac death |
| 11 | m | 65 | 1 | 12.5 | - | - | gastrointestinal bleeding |
| 12 | m | 67 | 1 | 25 | + | + | pleuritis |
| 13 | f | 80 | 1 | 25 | - | - | cardiac death |
| 14 | m | 65 | 1 | 50 | + | + | fat embolism |
| 15 | f | 79 | 1 | 80 | + | - | subdural hematoma |

epidemiological data, and emergency treatment prior to death. Deaths due to other forms of opioid abuse, i. e. intravenous or oral administration, were excluded. Ethics approval was not required.

RESULTS

15 deaths (0.74%) presented opioid patches at postmortem examination prior to autopsy. Details are given in Table 2. The patients were on average 75 years old (median 72), 7 were

female. 14 (93.3%) had only one single fentanyl patch applied with an average opioid dose of 49.4 µg/h (ranging from 12.5 to 100 µg/h). 4 patients were treated by emergency medical staff prior to death, i. e. CPR in 2 cases. Elevated or even fatal opioid doses were not found in the study group.

DISCUSSION

In contrast to previous studies [10], our data show no

evidence of improper handling of opioid patches, especially not in terms of a pre-hospital safety issue. However, the significance of our study is methodologically limited due to decreasing autopsy rates and (possibly) false certification of “natural deaths” in patients with opioid patches, either due to their pre-existing (malignant) illnesses requiring transdermal opioid application and/or insufficient postmortem examination. Furthermore, fentanyl patches might have been removed prior to postmortem examination by relatives or nursing staff, and no trace for possible opioid intoxication is left. More and wide-spread epidemiologic data will be gained from a forthcoming interdisciplinary cooperation between forensic and clinical institutions.

CONTRIBUTORS

CB, MT and HM conceived the study and designed the methodology. CB arranged the data collection, CB and HM analyzed the data. CB drafted the manuscript and all authors contributed substantially to its revision.

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