A new concept using holding chamber for nasal drug delivery

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Introduction

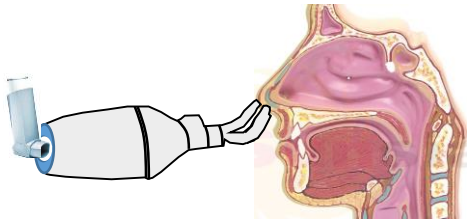
Topical nasal treatment is performed mainly with nasal sprays or even with nasal nebulizers :

- Nasal sprays are easy to use but limited in terms of region of interest targeting.
- Nebulizers offer the advantage to allow a better dispersion of the aerosol and improve time-retention of the drug into nasal cavities, but require long time of inhalation (5-10min).

A new concept would be to combine the advantages of sprays with the advantages of nebulizers using commercialized devices.

This study proposed to test this concept using a pMDI connected to a nasal holding chamber to improve nasal delivery.

New concept of nasal drug delivery



Pros Nasal nebulisers

- Aerosol deposition in all nasal cavities
- Drug deposition in sinus and ethmoid
- Long nasal retention of drug

Pros Nasal spray

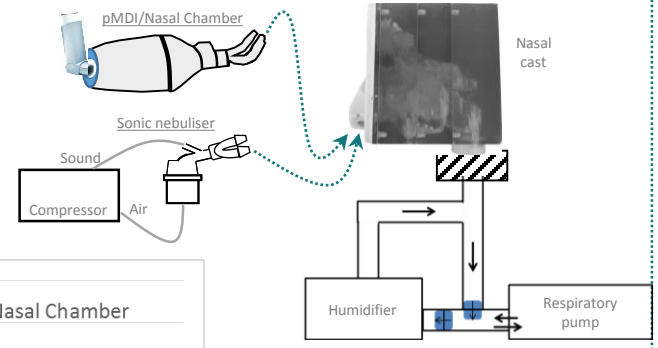
- GradeA (Guidelines)
- Portable and small
- Easy to use, slight cleaning
- Low cost

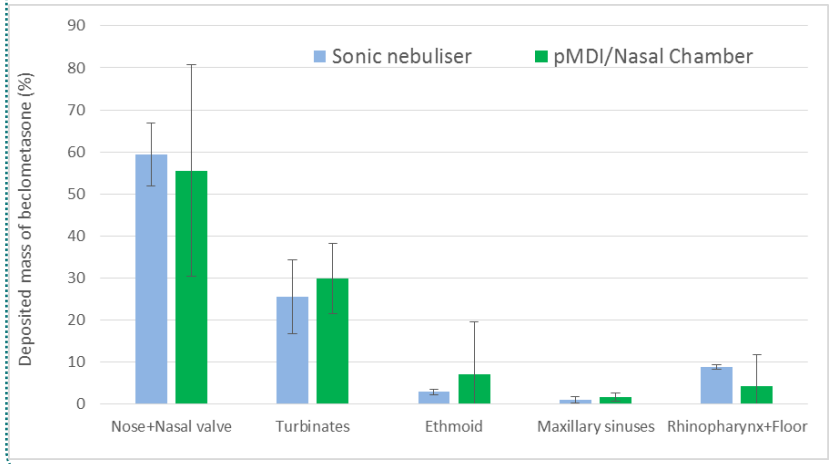
A pMDI/Nasal Chamber can combine the advantages of nasal sprays with of nasal nebulisers ?

In vitro study

➔ *to verify the nasal deposition pattern*

- Beclometasone administrations were performed in a ventilated and humidified nasal cast.
- Drug was delivered by sonic nebuliser (800µg/2mL) or pMDI/Nasal Chamber (250µg/10puffs).
- Deposited beclometasone in the different regions of the nasal cast was analyzed by spectrophotometry.
- Results were expressed in terms of the total nasal deposited drug.





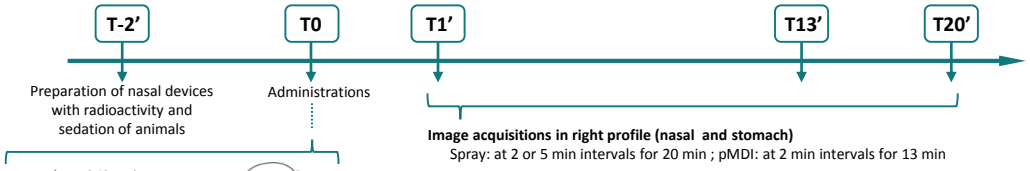
➔ The depostion of beclometasone in the nasal cast was similar using the sonic nebulizer or the pMDI/Nasal Chamber.

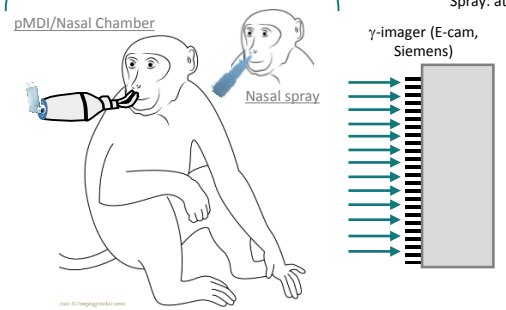
➔ 26-30% in turbinates ;
➔ 3-7% in ethmoid ;
➔ 1-2% in maxillary sinuses ;
➔ <10% on floor and rhinopharynx.

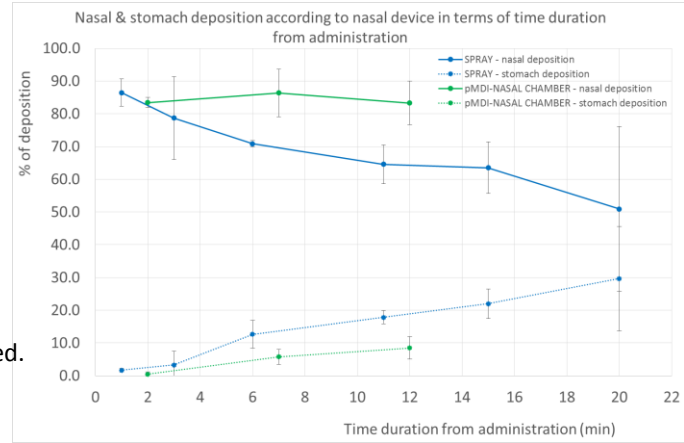
In vivo study

➔ *to evaluate the retention of drug in nasal cavities*

- The in vivo scintigraphy study was conducted using two sedated macacas.
- A radioactive tracer (Tc99m) was administered using a nasal spray (1.5MBq/2puffs) and the pMDI/Nasal Chamber (10MBq/20puffs).
- The distribution of the radioactive tracer in nasal cavities and, in easophage and stomach, was quantified during 20 min.







➔ Nasal deposition decreased with time after spray delivery while stomach passage increased.
➔ With pMDI/Nasal chambers, nasal deposition remains stable during the acquisitions (+/-4% during 12min).

CONCLUSION: In this proof of concept study, the pMDI/Nasal Chamber allows penetration, deposition and time-retention of drug into nasal cavities, similar to a nasal sonic nebulizer but keeping the advantage of rapid administration like nasal spray. Human depositions studies are required to validate these results.

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