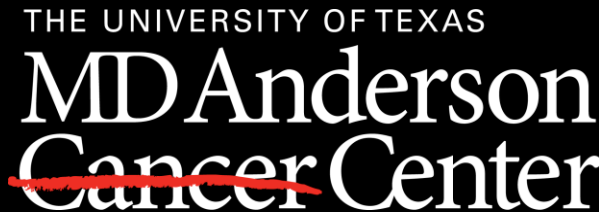




# Offering More for Persistent Dysphagia after Head & Neck Cancer: The Evolution of Boot Camp Swallowing Therapy

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## Abstract

**Background:** Persistent dysphagia after head and neck cancer (HNC) is a challenging clinical problem. Swallowing therapy conventionally employs exercise at a low level of intensity, often carried out at home by the patient (i.e., a “home program”). While effective as a preventive regimen, a critical minority of HNC survivors have refractory dysphagia after cancer treatment that is not responsive to standard home program or low intensity swallowing therapy routines.

**Methods:** A boot camp swallowing therapy program was started in our institution in 2012. Boot camp is a short, intense (daily, 2-3 weeks) outpatient therapy program. The hallmark of boot camp is mass practice of functional swallows in daily sessions that intensify the work load under a progressive-resistance model of exercise therapy. Published device-driven (“biofeedback”) and bolus-driven paradigms were adapted and implemented in the program under similar therapeutic principles. A consecutive case series was examined to evaluate therapy practices and early outcomes after boot camp in patients with persistent dysphagia per modified barium swallow (MBS) studies at least 3-months after HNC treatment. Outcome measures included the Penetration-Aspiration Scale per MBS, MD Anderson Dysphagia Inventory (MDADI), and functional status measures.

**Results:** 34 patients were enrolled in boot camp swallowing therapy over 2 years. All had a history of head and neck radiotherapy, 8 also had surgery to the primary site or radical neck dissection (median 5 years post-treatment). Most (59%) had late effects of treatment >3 years post-radiotherapy. 91% of patients were aspirating (median PAS, 8 “silent aspiration”) and 15 (44%) had a history of pneumonia. Half were gastrostomy-dependent. Only device-driven boot camp was offered in year 1; a bolus-driven paradigm was added in Year 2. Three were lost to follow-up. At a median follow-up of 2 months, global MDADI scores (pre 49.6, post 60.7, p=0.048) and PSS diet scores (pre 36.3, post 62.7, p<0.001) significantly improved after boot camp. Considering all domains (functional status, aspiration, perceived dysphagia), 81% improved at least one aspect of swallowing. 61% improved functional status (i.e., diet, tube). Penetration/aspiration scores did not significantly change (p=0.822).

**Conclusions:** Boot camp swallowing therapy shows promise for persistent dysphagia in HNC survivors. In this early program evaluation, conventional boot camp methods improved QOL and functional status in a majority of patients, but did not resolve penetration/aspiration. Refinements to our therapeutic model are ongoing to address all facets of dysphagia including chronic aspiration particularly in challenging populations such as those with late dysphagia.

## Objective

Assess outcomes of “boot camp” swallowing therapy program 2 years after implementation.

## BOOT CAMP swallow therapy

- ✓ Program started at MDACC in 2012
- ✓ Short, intense exercise-based outpatient swallowing therapy (daily x2-3 weeks)
- ✓ Mass practice of functional swallows
- ✓ Intensifying exercise load under progressive resistance model
- ✓ Two published models were adapted and implemented: device-driven (biofeedback)<sup>1</sup> and bolus-driven (McNeil)<sup>2</sup>

## Methods

- **Inclusion:** Boot camp for persistent dysphagia ≥3 months post-HNC treatment
- **Assessment times:** Intake, Discharge, Follow-up (1<sup>st</sup> post-boot camp MBS)
- **Pre-post measures assessed 3 domains of swallow function:**
  1. Penetration-aspiration,<sup>3</sup>
  2. Swallow-related QOL per MDADI<sup>4</sup>, and
  3. Functional status per FOIS<sup>5</sup>, PSSHN<sup>6</sup> diet, liquid restrictions (e.g., thickener), tube-dependence, and cans/day of nutritional supplement (PO or tube).
- Outcomes were assessed per intention-to-treat and a non-parametric Wilcoxon signed rank test was used for pre-post comparison (α=0.05)

## Patients

- 34 disease-free HNC survivors who enrolled in boot camp therapy for persistent dysphagia after H&N RT were studied
- 3 patients did not follow-up after boot camp

Fig. 1. CONSORT diagram.

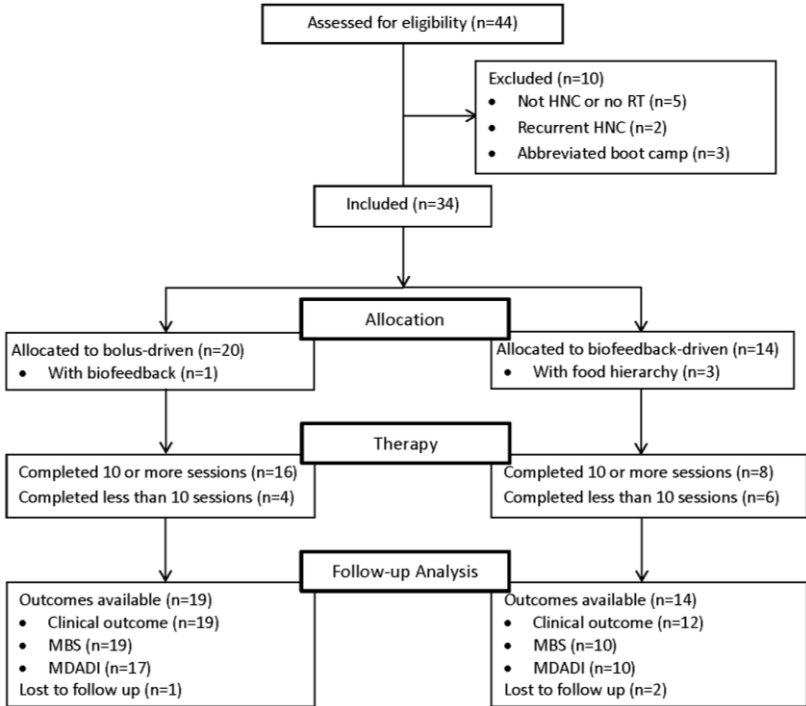


Table 1. Patient characteristics (n=34)	
Sex, no. (%)	
Female	6 (18)
Male	28 (82)
Age, y.	
Median (range)	65 (49-75)
Tumor site, no. (%)	
Oropharynx	26 (76)
Hypopharynx and larynx	2 (6)
Nasopharynx	2 (6)
Thyroid	1 (3)
Oral Cavity	3 (9)
T classification, no. (%)	
T1	1 (3)
T2	16 (47)
T3	13 (38)
T4	4 (12)
N Classification, no. (%)	
N0	2 (6)
N1	8 (24)
N2	23 (68)
NX	1 (3)
Therapeutic combination, no. (%)	
RT alone	4 (12)
Induction + RT	1 (3)
Concurrent + RT	21 (62)
Primary surgery + PORT	4 (12)
RT + Salvage Surgery	4 (12)
Time post-treatment, y.	
Median (range)	5 (0.3-20)
Pre-Boot Camp, no. (%)	
Feeding tube	17 (50)
Aspiration (PAS≥6)	31 (91)
Pneumonia	15 (44)
Restricted PO (FOIS<7)	33 (97)

### Boot Camp therapy

- Only device-driven (biofeedback) was offered in year 1
- A bolus-driven paradigm was added in year 2

Table 2. Boot camp summary (n=34)	
Sessions, median.	10
Weeks, median.	2
Primary paradigm, no. (%)	
Bolus-driven	20 (59)
Device driven	14 (41)
Daily sessions, no. (%)	
QD	24 (71)
BID	10 (29)

### Gains after Boot Camp

- 81% (25/31) improved at least 1 domain of swallowing after boot camp (functional status, perception, or penetration/aspiration).
- None improved in all 3 domains.

Table 3. Domains of improvement after boot camp (n=31)

61% had one of more of the following improvements in <i>functional status</i>	<ul style="list-style-type: none"><li>✓ Tube removal (6%)</li><li>✓ NPO to partial PO (12%)</li><li>✓ ↓ liquid restriction (24%)</li><li>✓ ↓ # cans nutritional supplement (24%)</li><li>✓ Median FOIS Δ +1.5 (p=0.054)</li><li>✓ Median PSSHN diet Δ +20 (p&lt;0.001)</li></ul>
16% improved <i>penetration-aspiration</i> scores	<ul style="list-style-type: none"><li>✓ 3 pts PAS Δ -1 point</li><li>✓ 2 pts PAS Δ ≥ -2 points</li><li>✓ Median PAS Δ 0 (p=0.822)</li></ul>
35% improved <i>swallow-specific QOL</i>	<ul style="list-style-type: none"><li>✓ 10 pts Δ ≥20 points global MDADI “my swallow affects my day to day activities”</li><li>✓ Mean MDADI ↑ all domains</li><li>✓ Mean global MDADI Δ +11.1 points (p=0.0487)</li></ul>

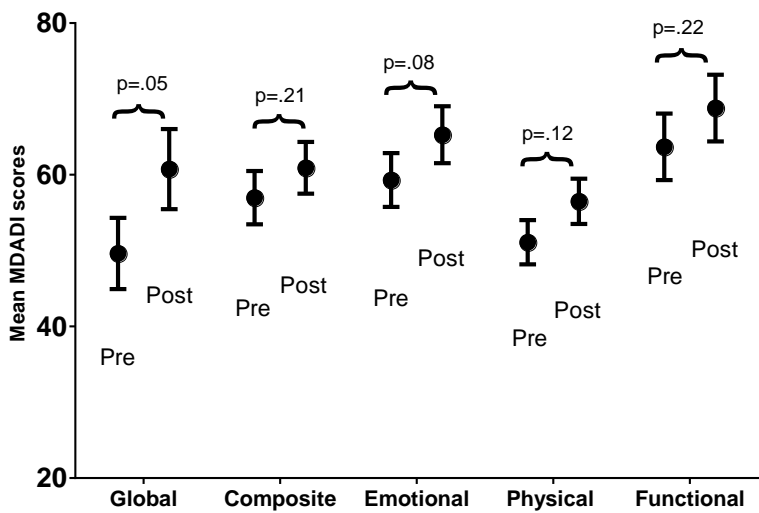


Fig. 2. Pre-Post MDADI Scores. Mean MDADI scores pre-post boot camp swallow therapy. Global MDADI significantly improved (Δ+11.1, p=0.049)

## Conclusions

Limited gains are reported after conventional limited-intensity swallowing therapy in patients with persistent dysphagia after head and neck radiotherapy<sup>7</sup>. We systematically implemented an individualized high-intensity swallowing therapy program (“boot camp”) for this challenging population. Boot camp was most likely to offer small improvements in functional status (e.g., decreasing daily cans of supplemental nutrition, or incremental improvements in range or complexity of oral intake), but major improvements such as tube removal were rare (6%) and only 1 patient stopped aspirating altogether. Nonetheless, we observed statistically significant improvement in global swallowing-specific QOL suggesting that intensive swallow therapy helps patients adapt to severe levels of swallowing dysfunction, essentially helping them to cope and compensate - to live better with the problem. These findings represent early outcomes of an evolving therapy program. Identifying therapy strategies to better improve aspiration and prevent pneumonia is a priority as we develop this program further.

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