

## Salivary Control & Sialorrhea

	Salivary Control
Salivary glands	Six salivary glands: 2 parotid glands 2 sublingual glands 2 submandibular glands buildingual glands buildingual glands buildingual glands buildingual glands comparison of the second s
Innervation	<ol> <li>Facial nerve (from superior salivary nucleus) innervates submandibular and sublingual glands</li> <li>Glossopharyngeal nerve (from superior salivary nucleus) innervates parotid glands</li> <li>Both are parasympathetic</li> </ol>
Saliva secretion	Submandibular glands: Secrete <b>70-80%</b> of saliva Sublingual glands: Secrete <b>5-10%</b> of saliva ○ Submandibular and sublingual glands → thick/mucousy secretions, mainly at rest Parotid glands: Secrete <b>15-20%</b> of saliva ○ Parotid glands → watery/serous secretions, mainly during eating/chewing
Daily saliva secretion	500 – 1500 mL/day
Swallowing frequency (average)	350 times/daytime (rest), 200 times/daytime (eating/chewing), 50 times/nighttime (sleeping) = total 600 times/day
Functions of saliva	<ol> <li>Protects teeth and gums</li> <li>Prepares foods for chewing and swallowing</li> <li>Initiates carbohydrate digestion</li> <li>Lubricates tongue and lips for speech</li> <li>Assists with oral hygiene</li> <li>Regulates acidity</li> <li>Facilitates taste</li> </ol>

	Sialorrhea
Definition	Inability to manage oral secretions
Age	Drooling beyond <b>4 years of age</b> is ABNORMAL
Causes	<ul> <li>1) Hypersalivation         <ul> <li>Dyskinetic CP</li> <li>Complex temporal lobe epilepsy</li> <li>Medications                 <ul></ul></li></ul></li></ul>



CP       10-40 %         Prevalence increases with increased severity of gross motor impairment in CP (GMFCS)         •       Prevalence increases with increased severity of gross motor impairment in CP (GMFCS)         •       Tends to improve over time •       •         •       Possibly due to dental maturation         Predictors of sialorrhea in children with CP       1) Head/body position         3) GERD       9 bental carries/malocclusion         3) Medications (see under "causes")       5) Co-existing epilepsy         6) Poor or no speech       7) Intellectual disability         8) GMFCS IV or V       Anterior: Saliva spilled from the mouth that is clearly visible         Posterior: Saliva spilled into the pharynx possibly creating a risk of aspiration • Often both types exist together         Complications of sialorrhea       • Skin irritation • Unpleasant odor         • Caregiver and teacher stress • Social impact (e.g., isolation, rejection, poor self-esteem, shame, stigmatization) • Damage to clothing/bibs/communication devices • Interference with speech         Posterior: sialorrhea: • Recurrent/chronic respiratory symptoms: Cough, wheeze, chocking • Aspiration pneumonia: • Leads to frequent suctioning > injury • Dehydration         Clinical assessment       General: Hydration assessment MSK: Head/body position Skin: Perioral skin assessment         KW: Head/body position Skin: Perioral examption (to check for aspiration) GI: GERD control assessment       OT & SLP can help	<ul> <li>Prevalence increases with increased severity or (GMFCS)</li> <li>Tends to improve over time         <ul> <li>Possibly due to dental maturation</li> </ul> </li> <li>edictors of         <ul> <li>alorrhea in</li> <li>Bental carries/malocclusion</li> <li>GERD</li> <li>Medications (see under "causes")</li> <li>Co-existing epilepsy</li> <li>Poor or no speech</li> <li>Intellectual disability</li> <li>GMFCS IV or V</li> </ul> </li> <li>Pes of         <ul> <li>alorrhea</li> <li>Offen both types ovist together</li> </ul> </li> </ul>	f gross motor impairment in CP The 1 <sup>st</sup> 4 can be optimized when treating sialorrhea in children with CP
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<ul> <li>Aspiration pneumonia:         <ul> <li>Diagnosis of salivary aspiration through <u>radionucleotide salivagram</u></li> </ul> </li> <li>Anterior &amp; posterior sialorrhea:         <ul> <li>Leads to frequent suctioning → injury</li> <li>Dehydration</li> </ul> </li> <li>Clinical assessment</li> <li>General: Hydration assessment         <ul> <li>MSK: Head/body position</li> <li>Skin: Perioral skin assessment</li> <li>ENT: Oral health/dentation, mouth/tongue/jaw movements, swallowing assessment</li> <li>Neuro: Neurological examination</li> <li>Resp: Respiratory examination (to check for aspiration)</li> <li>GI &amp; SLP can help with assessment</li> <li>Meds: Medication review</li> </ul> </li> <li>Methods to         <ul> <li>Dooling Impact Scale – found on the website www.pedcomplexcare.com</li> <li>DOS Scale – found on the website www.pedcomplexcare.com</li> </ul> </li> </ul>	<ul> <li>Recurrent/chronic respiratory symptoms: Couc</li> </ul>	gh, wheeze, chocking
○       Diagnosis of salivary aspiration through <u>radionucleotide salivagram</u> Anterior & posterior sialorrhea:       •         •       Leads to frequent suctioning → injury         •       Dehydration         Clinical assessment       General: Hydration assessment         MSK: Head/body position       Skin: Perioral skin assessment         ENT: Oral health/dentation, mouth/tongue/jaw movements, swallowing assessment         Neuro: Neurological examination       OT & SLP can help with assessment         Meds: Medication review       I)         Methods to quantify       1)         2)       DO5 Scale – found on the website www pedcomplexcare.com	<ul> <li>Aspiration pneumonia:</li> </ul>	
Anterior & posterior statormea:         •       Leads to frequent suctioning → injury         •       Dehydration         Clinical assessment       General: Hydration assessment         MSK: Head/body position       Skin: Perioral skin assessment         ENT: Oral health/dentation, mouth/tongue/jaw movements, swallowing assessment         Neuro: Neurological examination         Resp: Respiratory examination (to check for aspiration)         GI: GERD control assessment         Meds: Medication review         Methods to         1)       Drooling Impact Scale – found on the website www.pedcomplexcare.com         2)       DO5 Scale – found on the website www.pedcomplexcare.com	Diagnosis of salivary aspiration through	gh <u>radionucleotide salivagram</u>
Clinical       General: Hydration         assessment       General: Hydration assessment         MSK: Head/body position       Skin: Perioral skin assessment         ENT: Oral health/dentation, mouth/tongue/jaw movements, swallowing assessment         Neuro: Neurological examination         Resp: Respiratory examination (to check for aspiration)         GI: GERD control assessment         Meds: Medication review         Methods to         1)       Drooling Impact Scale – found on the website www.pedcomplexcare.com         2)       DO5 Scale – found on the website www.pedcomplexcare.com	Anterior & posterior statormea:	
Clinical assessment       General: Hydration assessment         MSK: Head/body position       MSK: Head/body position         Skin: Perioral skin assessment       ENT: Oral health/dentation, mouth/tongue/jaw movements, swallowing assessment         Neuro: Neurological examination       OT & SLP can help with         Resp: Respiratory examination (to check for aspiration)       OT & SLP can help with         GI: GERD control assessment       Meds: Medication review         Methods to       1) Drooling Impact Scale – found on the website www.pedcomplexcare.com         2)       DO5 Scale – found on the website www.pedcomplexcare.com	<ul> <li>Dehvdration</li> </ul>	
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Skin: Perioral skin assessment         ENT: Oral health/dentation, mouth/tongue/jaw movements, swallowing assessment         Neuro: Neurological examination         Resp: Respiratory examination (to check for aspiration)         GI: GERD control assessment         Meds: Medication review         Methods to         1) Drooling Impact Scale – found on the website www.pedcomplexcare.com         2) DO5 Scale – found on the website www.pedcomplexcare.com	sessment MSK: Head/body position	
Methods to       1)       Drooling Impact Scale – found on the website www.pedcomplexcare.com         2)       DO5 Scale – found on the website www.pedcomplexcare.com	Skin: Perioral skin assessment	onto avallavina passament
Resp: Respiratory examination (to check for aspiration)       OT & SLP can help with assessment         GI: GERD control assessment       Meds: Medication review         Methods to quantify       1) Drooling Impact Scale – found on the website www.pedcomplexcare.com         2) DO5 Scale – found on the website www.pedcomplexcare.com	<b>Neuro:</b> Neurological examination	
GI: GERD control assessment     assessment       Meds: Medication review     1)       Methods to     1)       Openatify     2)       DO5 Scale = found on the website www.pedcomplexcare.com	<b>Resp:</b> Respiratory examination (to check for aspiration)	) OT & SLP can help with
Meds: Medication review           Methods to         1) Drooling Impact Scale – found on the website www.pedcomplexcare.com           quantify         2) DO5 Scale – found on the website www.pedcomplexcare.com	<b>GI:</b> GERD control assessment	assessment
Methods to       1) Drooling Impact Scale – found on the website www.pedcomplexcare.com         Quantify       2) DO5 Scale – found on the website www.pedcomplexcare.com	Meds: Medication review	
<b>duantity</b> 1.2) DUS Scale - found on the website www.pedcompleycare.com	<b>ethods to</b> 1) Drooling Impact Scale – found on the website <u>www</u>	v.pedcomplexcare.com
sialorrhaa 3) Drooling Frequency and Severity Scale (below)	antify 2) DQ5 Scale – found on the website <u>www.pedcomple</u> 3) Drooling Frequency and Severity Scale (below)	excare.com
Sialormea (S) Droding frequency and Sevency Scale (below)	soffice (below)	
Severity Frequency	Severity	Frequency
L Dry – never drools	Dry – never drools	l Never drools
2 Mild only wat on the line 2 Occasionally drools	2 Mild only wat on the line	2 Occasionally droots
2 Mild – Office and the line and this 2 Occasionally droots	2 Madamta wat on the line and ship	2 Occasionally droots
3 Proderate – wet on the lips and chin 3 Frequently drools	3 Moderate – wet on the lips and chin	3 Frequently drools
4 Severe – drools to the extent that clothing becomes damp 4 Constant drooling	4 Severe – drools to the extent that clothing becomes da	imp 4 Constant drooling
5 Profuse – clothing, hands, tray and objects are wet	5 Profuse – clothing, hands, tray and objects are wet	
	The dreading replyings from both scales are added to get the	r to make a combined dreating score
The drooling rankings from both scales are added together to make a combined drooling scare	The drooming rankings from both scales are added together	to make a combined drooling score
The drooling rankings from both scales are added together to make a combined drooling score		
The drooling rankings from both scales are added together to make a combined drooling score		
The drooling rankings from both scales are added together to make a combined drooling score To be done on <b>regular basis</b> (e.g., q3-6 months) AND <b>before &amp; after any intervention</b>	To be done on <b>regular basis</b> (e.g., q3-6 months) AND	before & after any intervention



	Ма	nagement of sialorrhea	
Indication	If no/minimal complication	ons $\rightarrow$ no treatment indicated	
Conservative	1) Assess/correct facto	rs that may contribute to sialorrhea: Po	sitioning, medications,
	GERD, dental issue	es	
	2) Bibs (dap NOT wipe)	), suctioning (gentile), oro-motor therap	y (by OT/SLP), behavioral
	therapy (by psychological seconds and the TEL)	ogist), intra-oral appliances (be dentist),	optimizing IF (lower
	Intra-oral appliand	ce (Innsbruck Sensory Motor Activator an	d Regulator – ISMAR):
	- Stabilizes t	he jaw to facilitate lip and tongue movements	
	- Worn for sh	nort periods each day then overnight	
	- Evidence: E	Anture deptation (>6 V/O) good cognitive fun	ction and motivation
	- Requires. I		
		Oral shield	
		Lateral defr	
		Oral shield	
		Vestibular	
		pads Pads	
Mede		Medication MoA	
Meus	Reduction of saliva produ	iction (blocks parasympathetic innervati	on to glands)
		Medication options	
	Atropine (PO drops)	Scopolamine (patch)	Glycopyrrolate
	<ul> <li>1% ophthalmic</li> </ul>	• <b>DOSE</b> (1 patch = 1.5 mg	(PO/GT/JT)
	solution	scopolamine):	• <b>DOSE:</b> 0.02
	(pharmacy can	<ul> <li>&lt; 20 Kg = ¼ patch</li> </ul>	mg/Kg/DOSE PO TID,
	make 0.25% &	$\circ$ 20-50 Kg = $\frac{1}{2}$ patch	titrate up every 5-7
	0.5% solutions)	<ul> <li>Takes 24 hours to reach steady</li> </ul>	
	• DOSE: 1-2 drops	state; for acute symptoms other	mg/kg/DOSE PO TID
	6br (can be given	drugs should be used	(IIIdX 3 IIIg/DOSE)
	less frequently	<ul> <li>Do not break the matrix by</li> </ul>	formulation orally
	i.e., daily, BID or	cutting the patch in $\frac{1}{2}$ or $\frac{1}{4}$ (see	<ul> <li>Discontinue gradually</li> </ul>
	TID)	below for application)	over 2 weeks to prevent
	<ul> <li>Make sure to dry</li> </ul>	<ul> <li>Apply the patch on the mastoid</li> </ul>	withdrawal symptoms
	mouth/suction	Change/retate g24 72br	<ul> <li>May decrease gastric</li> </ul>
	before use	• Change/Totate $q24$ -72111 • Crosses BBB $\rightarrow$ more CNS side	acid secretion
	<ul> <li>Wash hands after</li> </ul>	effects	<ul> <li>Side effects are similar</li> </ul>
	use (causes dilated	<ul> <li>Antiemetic</li> </ul>	to atropine side effects
	pupils if in contact	<ul> <li>Discontinue gradually over 2</li> </ul>	in table below, except:
	• Inform parants	weeks to prevent withdrawal	<ul> <li>Less CNS side</li> <li>offects as it does</li> </ul>
	<ul> <li>Inform parents</li> <li>that the container</li> </ul>	symptoms	NOT cross BBB
	says "eve drops"	<ul> <li>Can cause local skin irritation</li> </ul>	<ul> <li>Less mydriasis and</li> </ul>
	<ul> <li>Crosses BBB →</li> </ul>	(change application site	cvcloplegia
	more CNS side	regularly)	<ul> <li>Less tachycardia</li> </ul>
	effects (e.g.,	Application of part of a patch:	<ul> <li>Feeding tube:</li> </ul>
	sedation, poor		<ul> <li>Can be given via</li> </ul>
	seizure control)	Skin	G-tube
	<ul> <li>Causes more</li> </ul>	Tegaderm	• No specific
	tachycardia than		information on the
	otner anti-	Patch	Jejunal
	medications		auministration of
	<ul> <li>Can be delivered</li> </ul>		(monitor for loss
	using a spoon to	Capuse 1/ or 1/ of a patch	of efficacy/side
	facilitate mouth	Rotate patch a24-72hr	effects)
	opening	Make sure patient is <b>NOT allergic</b> to	
		adhesive/patch	

Last update: Jan 2024



	Others:         Trih           •         Trih           •         •           •         •           •         Ipra           •         Ipra           •         Hyo           •         •           •         •           •         Ipra           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •	exyphenidyl (Artane For children >3 Y/C Treats both sialorrh DOSE: Initial dose dose >10 mg → div (100 mg/day) Taper gradually to l tropium bromide: 2 scine butylbromide Antispasmodic (de Semi-synthetic der Peripheral antichol Dose: 1 month-2 y years (5 mg TID o mg TID or OID PRI	2): hea and spasticity/dy 1 mg BID x7 days, t 7 TID-QID (not BID), D/C 50-500mCg nebulization (Buscopan): ceases GI and GU sp rivative of scopolami inergic effect (does years (300-500 mcg, r QID PRN), 5-12 ye N)	stonia itrate up every 3 da target dose (6-40 ition/MDI q4-6hr Pl pasms) ne not cross BBB) 'Kg TID or QID PRN ars (10 mg TID or	ays by 1-2 mg/day, if mg/day), max daily o N N I – max 5 mg/DOSE) QID PRN), 12-18 yea	<sup>;</sup> daily dose , 2-5 ırs (20
			Side effects & co	ntraindications		
	Side off	acts	Side effects & cu	Contraindicatio		
	Side eff           1)         Con:           2)         Urin           3)         Tact           4)         Hyp           5)         Vom           6)         Behi           7)         Ove           8)         Faci           risk         9)           9)         Sen:           10)         Seiz           11)         Myd           12)         Seda	ects: stipation ary retention nycardia (MOST with ertension hiting avioral changes/irrit r-drying of secretior al flushing/impaired of hyperthermia in sitization ure control riasis and cycloplegi ation	n atropine) ability as ability to sweat → hot environments ia	Contraindication 1) Glaucoma 2) Tachyarrhyt 3) Paralytic ileu 4) Urinary traco and renal U, 5) Hyperthyroi 6) Pregnancy 7) Myasthenia Caution with cont medications	INS: hmias us/GI obstruction t obstruction (check f 'S before use, if avail dism graves current anticholinerg	RFT lable) lic
		Compa	rative Effects	of Anticholi	nergics	
		Effect	Atropine	Scopolamine	Glycopyrrolate	
		Heart rate	++	-/+	+	
		Mydriasis and cycloplegia	+	+++		
		Antisialagogue effect	+	+++	++	
		Sedative effect	+	+++	19	
		Increased gastric fluid pH			-/+	
		Central nervous system toxicity	+	++	1	
		Lower esophageal sphincter relaxation	++	++	++	
Botox	<ul> <li>MOA</li> <li>Site:</li> <li>Tim</li> <li>Don</li> <li>guid</li> <li>DOS</li> <li>Side</li> <li><ul> <li><ul> <li><ul></ul></li></ul></li></ul></li></ul>	A: Reduction of saliv s of injection: Inject eline: Onset in 1-: e by ENT/IR, under ance; injects 2 subr SE: 25-50 IU/gland e-effects (less side-e Saliva thickening Pain, swelling and Mild dysphagia in f	a production t submandibular and <b>3 days, peaks at 2</b> : local anesthesia/cor mandibular glands + (do NOT exceed 200 effects with the imag hematoma at injecti first 2 weeks	parotid glands - <b>3 weeks, lasts fo</b> scious sedation (ra 2 parotid glands IU in total) e-guided approach on site	r <b>3-6 months</b> rely GA); requires U/ ):	′S



	<ul> <li>Most significant reported problems are rare:</li> </ul>		
	<b>A.</b> Severe dysphagia in first 2 weeks (may require brief hospitalization and		
	NG leeding)		
	<b>D.</b> Aspiration preumona		
	C. Loss of motor control of the head & neck		
Surgical	<ul> <li>Duct ligation (parotid, submandibular or both); parents must be aware that it is</li> </ul>		
	irreversible, and the child <b>won't be able to feed orally after it's done</b>		
	<ul> <li>Bilateral submandibular gland excision</li> </ul>		
	Submandibular duct relocation		
	<ul> <li>Done by ENT, under general anesthesia</li> </ul>		

## Approach to sialorrhea:



## **References:**

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